EXD.
As.6

The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XX] 1941—42 [No. 2

IN THIS ISSUE

Live Stock of Mysore—Cattle.

Methods for Improving Paddy Production in Mysore.

1942

The

Mysore Chemicals and Fertilisers, Ltd.

(Manufacturing Operations were commenced in May 1940)

REGISTERED OFFICE:

1128, Vanivilas Road, MYSORE

Telegram : " CHEMI " Mysore

Telephone: 243

Works: BELAGULA

(Mysore State Railway)

on the way to Brindavan Gardens

(KRISHNARAJASAGAR)

Telephone: 435

Capital :

Authorised and Issued .. Rs. 25,00,000

(10% of the shares subscribed by Government of Mysore)

Manufacturers of

Sulphuric Acid, Ammonia, Ammonium Sulphate, Superphosphates

Fertiliser Mixtures and other Chemicals

CONTENTS

PAGE

Live Stock of Mysore: Cattle—
By P. McIsaac, B.Sc. (Hons.), Ph.D., Assistant Superintendent, Veterinary Services 53

Methods for Improving Paddy Production in Mysore—
By S. V. Sharma, Senior Assistant Botanist, Paddy Work .. 62

The Agricultural Colony—
By Byata Rangappa, Colonist 69

A Brief Note on the Development of the Poultry Section—
By S. B. Vasudeva Rao, L.V.P. (Hons.), Poultry Special Officer 72

The Twenty-second Annual General Meeting and Field Day of The Mysore Agricultural and Experimental Union, Bangalore
M. V. 74

Report of the Secretary, The Mysore Agricultural and Experimental Union, Bangalore 78

SELECTIONS—
Candling Eggs—Groundnut in India—Industrial Uses of Sugarcane Bagasse 82

List of Publications Received 91

THE MYSORE AGRICULTURAL JOURNAL

A Quarterly Magazine Published by
The Mysore Agricultural and Experimental Union (Regd.)

BANGALORE

Chief Editor :

M. J. NARASIMHAN, B.A.,
Deputy Director of Agriculture.

Subscription Rates :

FREE TO MEMBERS OF THE UNION

Rupees 3-5-0 per Volume to Non-Members

ADVERTISEMENT RATES ON APPLICATION

For particulars apply to :

SECRETARY

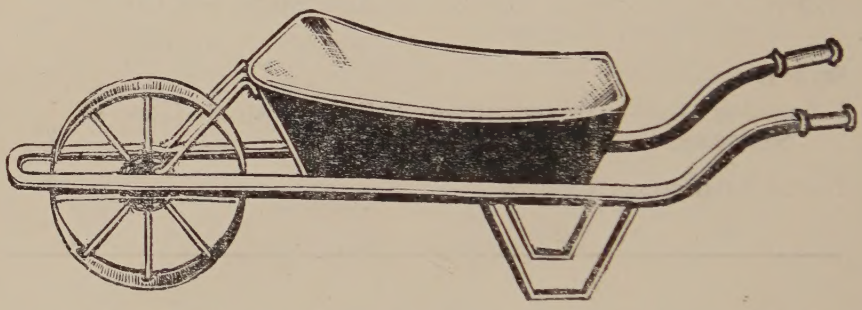
The Mysore Agricultural & Experimental Union

Seshadri Road, BANGALORE

TRANSPORT BY HEAD LOADS

On one side we see well-equipped modern factories making anything up to aeroplanes and side by side toils the ordinary man carrying bricks, stones and rubbish loaded on the head or back in the most primitive fashion.

In the parks, gardens, farms and cattleyards there is no need to carry anything on the head or back. Our Wheel Barrows are made to carry 6 head loads which one man can move about with ease and convenience. Use it for carrying waste, rubbish, manure, fodder, earth, brick, mortar, jelly or anything else you like. Lakhs of rupees now wasted by uneconomical methods of transportation can be saved by using the Wheel Barrow.



Descriptive Leaflet Free

Wheel Barrow—all steel—capacity 3½ cubic feet—fitted with our roller handles for grip—Rs. 30 each

Water Barrow—Capacity 18 gallons—Rs. 32 each.

Our manufactures include Garden Shears, Secateurs, Trenching Hoes, Hand Forks, Kodaly Forks, Felling Knives, Felling Axes and various other implements.

MYSORE (Govt.) IMPLEMENTS FACTORY

HASSAN P.O.

(Mysore State Railway)

The Mysore Agricultural Journal

(The Organ of the Mysore Agricultural and Experimental Union)

Vol. XX] 1941—42 [No. 2

Live Stock of Mysore

Cattle

By

P. McIsaac, B.Sc. (Hons.), Ph.D.

Introduction—Mysore State, with its equable climate, has for centuries past earned for itself a high reputation for its breeds of cattle and has thus played a very important part in the supply of hardy draught animals for meeting the demands of the State and for supplies to the Bombay and Madras Presidencies, to the East Indies, Egypt and even to South America.

The State comprises an area of over 29,000 square miles, divided roughly into two sections, the *malnad* or hilly country towards the West, having a rainfall of over 30 inches and the *maidan* or plains country in the East, having a rainfall of 25 to 30 inches. The equable climate and the high land in the form of a plateau afford rich and extensive pastures, which have not yet been encroached upon by the cultivator to any considerable extent. These pastures have favoured cattle husbandry (i) of the *amrit mahal* breed in a semi-wild state in the vast *kavals* or open pastures and (ii) the *hallikar* breed reared by the raiyats in their villages. These are the two most noted breeds of the several varieties of cattle bred in the State.

History—It is interesting to look into the history of the inception of the *amrit mahal* herds which had their origin in the *hallikar* cows imported into the State from Vijayanagar, leading to the establishment of the herds of the Vijayanagar Viceroy at Seringapatam between 1572 and 1600. The successive rulers contributed to the expansion of the establishment until, in the reign of the celebrated Chickadevaraja Wadeyar, pasture lands in different parts of the State were assigned for the cattle and the establishment was constituted into a Department of State styled '*Benne Chavadi*' or Dairy Department.

This Department seems to have reached its peak under Hyder Ali and his son Tippu Sultan, who changed the name of the Department from

'*Benne Chavadi*' to "*amrit* (Nectar) *mahal*" and issued "*Hukum Nama*" or regulations for its efficient administration. It is known that Tippu himself used to distribute prizes at the annual musters of the herds.

After the fall of Tippu at Seringapatam the British Government made over this cattle establishment to the Government of Mysore, with the stipulation that a steady supply of bullocks required for military transport be assured. Later the British Government assumed direct charge of the Government herds in Mysore, with a view to further improvement of the herds, under Captain Harvey of the Madras Commissariat. Considerable improvement was achieved, the herds almost doubling themselves in number in ten years' time.

In 1840, the herds and pasture lands of the Maharaja of Mysore were amalgamated with those of the British Government and placed under the control of the Mysore Commission. From motives of economy, however, several of the herds were broken up and sold under the orders of Sir Charles Trevelyan. This procedure led to definite detriment of the breed, affecting specially the public service. During the years 1866 to 1870, however, a start was made to build up the herds again with 4,000 cows and 100 bulls, representing the stock available at the time, which were purchased by the Madras Government from the Maharaja of Mysore, who had been a large buyer of cattle in the breaking up of the herds.

Though the best animals had been taken by the Pasha of Egypt, on the breaking up of the herds, there were still some of the finest types of cattle with the establishment of Mysore. Until 1860, the three district varieties of the *amrit mahal* breed, *i.e.*, the *Hagalvadi*, *Hallikar* and *Chitaldrug*, were kept pure by forming them into separate herds, but the constant changes introduced in their administration coupled with the inevitable infiltration of poor private stock does not seem to have helped in the preservation of their distinctive characteristics and their original purity.

With a view to reforming of these *amrit mahal* herds, the Mysore Government purchased 12,502 head of *amrit mahal* cattle, of which 4,618 cows and 177 breeding bulls were obtained from the Madras Government, on the stipulation that the latter were to be supplied for a certain period with three year old bullocks. The number of *kavals* or pasture lands assigned to these cattle was 240, comprising 4,13,539 acres.

The *amrit mahal* establishment, thus reconstituted, formed part of the Mysore Military Department till 1920, the principal object being to supply bullocks for the British Transport corps and the Mysore Forces. The establishment was thus a quasi-military institution. With the rapid advance in mechanisation of Military transport within recent years, however, it was felt that the chief object of maintaining this establishment now lay in supplying the increasing agricultural population of the State with good cattle. It was fit, therefore, to affiliate this establishment with the Agricultural Department in the year 1920. As the number of cattle was far in excess of

the demand and with a view to relinquish large areas of pasture land to meet the increasing demand for cultivable land, the herds were reduced by sale and *kaval* land surrendered to the Revenue Department.

At present the *amrit mahal* may be considered an entirely draught breed. That bullocks of *amrit mahal* breed have been useful for draught purposes, above other breeds, being active, fiery and walking much faster than other bullock, and even the accompanying troops, is borne out by the rapid campaigns and manouvres accomplished by Tippu Sultan, the British Campaign in Afghanistan and the role played by the Mysore Transport Corps in Mesopotamia during the war of 1914–18. In this latter conection the General Officer Commanding, Force " D ", Baghdad, wrote of the *amrit mahal* bullocks under his command—" The bullocks of this Corps have proved their value at the work on which they have been employed. They can walk as fast as a mule on the march, and are steadier when crossing pontoon bridges and over bad roads, and in spite of the difficulty of giving them the rations to which they have become accustomed, have stood the climate well". That these bullocks have stood the extreme difficulties of climate and natural food in the British campaigns in East Africa and Abyssinia remains for history to tell of the present War, started in 1939. Allusions in the despatches during the Peninsular War in Spain show how much the Great Duke regretted he had not the assistance of the *amrit mahal* bullocks, which he had in his campaigns in North-West India.

The qualities of hardihood and spirit, characteristic of the *amrit mahal* breed are largely the result of the manner in which the cattle of this breed are maintained and brought up. Divided into herds of about 300 head each, these cattle subsist entirely on what they can pick up on the pasture lands over the greater portions of western and central Mysore. The pastures are classified as hot, cold weather and wet weather *kavals* and a certain number each of such *kavals* is allotted to each herd so as to ensure suitable grazing, all the year round. If it should prove a particularly dry year or there has not been sufficient rain to benefit pastures in the *kavals* the herds are taken to the jungles for about five months every year where the first showers of the advancing monsoon ensure an early and abundant growth of grass. These semi-wild herds roam about the vast *kavals* and forests, having only the trees as their shelter against sun and rain. On this account contagious and infectious diseases rarely make their appearance. This method of rearing leads, moreover, to the survival of the fittest, which is the rule of nature in the world of biology.

Consequent to the affiliation of the Amrit Mahal Department with the Department of Agriculture, the chief object has been to supply superior cattle to Agriculturists of the State and Government institutions. The semi-wild herds are unsuited for agricultural purposes, the raiyats not being in a position to tame and train the wild bulls as was being done by the Military Department. A method was to be devised by which excellent *amrit mahal*

bulls and bullocks were to be made available to the agricultural population of the State.

Accordingly, a Cattle Breeding Station at Ajjampur in Kadur District was started in the year 1929, where the *amrit mahal* cattle are maintained under domestic and farm conditions. The foundation stock of this Station consisted of the best available cows from the Government herds. The Cattle Breeding Station, Ajjampur, with its Sub-Station at Basur, nine miles away, has a strength of about 1,000 cattle, which have the benefit of free grazing in the attached *kavals* and jola and sun-flower fodder grown in the cultivated areas of the Stations. This fodder is fed as hay or as silage (where there are facilities for making this important cattle food).

Dairying to a certain extent is carried out at the Cattle Breeding Station, Ajjampur, and the milk yield of the cows is recorded. The object of this milk recording is primarily to become acquainted with the milking capacity of the *amrit mahal* breed of cows, maintained under semi-dairying conditions and also to breed bulls and bull-calves with a milk pedigree. The yield from the cows has been found to show that these cows under the present conditions cannot be considered a milking breed. They produce milk which is slightly more than what is required for rearing of their calves. The chief aim at the Cattle Breeding Station at present is the production of domesticated stud bulls and draught animals, which combine efficiency, hardihood, good breeding qualities and at the same time are capable of being handled easily.

With the success and experience gained at the Cattle Breeding Station, Ajjampur, the aim of the Agricultural Department is to institute such Stations in each district of the State as soon as convenient and possible. With this object in view Cattle Breeding Stations have already been started also at Hunsur, for Mysore District, at Devapura near Hosadurga for Chitaldrug District, at Garudapalya in Malur Taluk for Kolar District and at Lakkihalli for Tumkur District. It is hoped in the near future to institute some more Cattle Breeding Stations.

Institution of these Cattle Breeding Stations, which have a sufficient area of pasturage or *kavals* attached to them, has resulted in the surrender of several thousand acres of *kaval* land to the Revenue Department for the use of State Agriculturists, to whom is assured a steady supply of stud bulls and bull-calves, valued at Rs. 100 and Rs. 50 each, respectively, with a view to rapidly improving the cattle of the State. Moreover, as a further inducement to the raiyats of the State to purchase such good bulls for their herds, a Village Panchayet pruchasing a bull pays Rs. 50 only, the balance of Rs. 50 being paid by the local District Board. Bulls proving unfit for breeding purposes within a year of purchase are given free exchange from the Cattle Breeding Station. Government have been pleased to distribute bull-calves within 2 years of age as raiyats find them more amenable to domestication and treatment than bulls. The total number of bulls, cows, bull-calves

bullocks and heifers distributed during the years 1937–38 till 1940–41 is as follows:—

Year	Bulls	Cows	Bull-calves	Bullocks	Heifers	Total
1937–38 ..	23	..	51	19	21	114
1938–39 ..	20	16	59	2	..	97
1939–40 ..	37	3	31	10	5	86
1940–41 ..	45	..	38	45	..	128
TOTAL ..	125	19	179	76	26	425

As a further help to improvement of cattle of the Mysore State an aided Cattle Breeding Scheme was instituted by Government in 1932, whereby nine State-aided Cattle Breeders were organised each having now a herd of up to 250 head of cattle. Government take an interest in these breeders in that they are obliged to maintain records and submit statements of their animals, and their herds are inspected and checked at least once a year by Officers of the Office of the Superintendent of Veterinary Services in Mysore, Bangalore. As is done in the Amrit Mahal Department these breeders are advised at these annual musters of their herds to dispose of any animals that are found to be coloured other than the grey of the breed, especially breeding bulls. This precaution has tended to keep the general colour of the breed more in conformity to the herd colour which will facilitate Government drawing on their herds for the supply of bulls and bull-calves to raiyats when necessity arises.

By the middle of the year 1941–42, the total strength of the *amrit mahal* herds in the State comprised the following:—

1.	Amrit Mahal Department	1,401 head
2.	Cattle Breeding Stations	1,498 ,,
3.	State-aided Breeders	1,278 ,,
	TOTAL ..	4,177 ,,

The number of *kavals* for the Government herds has, in consequence of the reduced herds and surrender of land to the Revenue Department for agricultural purposes, been reduced to 149 *kavals* with an area of 2,24,787 acres, from the original 240 *kavals* comprising 4,13,539 acres.

Government in their constant endeavour to benefit the raiyat and improve the cattle of the State now provide funds for the purchase of *hallikar* breeding bulls to be stationed at veterinary hospitals and dispensaries, primarily for improvement of the cattle of the village or town and of the outlying rural population who are anxious to avail themselves of the services of a good breeding bull at the usual service rates. These bulls are located at

municipalities who are willing to pay their quota for the maintenance of the bulls and in return receive all the revenue accruing from them. Other municipalities also willing to provide accommodation for the bulls and pay for their maintenance are provided with bulls free of cost. Such bulls come under the inspection and advice for health and maintenance of the local Veterinary Inspector and the District Veterinary and Live-Stock Officer of the District, under the supervision of the Superintendent, Veterinary Services in Mysore.

A regular feature of these *hallikar* bulls is that they are maintained under entirely domestic conditions and their services are fully recorded. Their resulting calves are tattooed so that in course of time it will be possible to judge the worth of the stud bull.

Apart from tackling in this manner the improvement of cattle in urban areas, Government have also instituted methods whereby improvement of buffaloes in urban areas is to be accomplished. In the same manner as *hallikar* bulls, a buffalo bull of *murrah* or other improved breed is supplied to each Veterinary Institution or to Municipality where there are facilities for housing accommodation and maintenance of these buffalo bulls. In this manner, a start has been made to improve not only the cattle but also buffaloes in the State. Upto the year 1941–42, *hallikar* bulls and buffalo stud bulls of the improved breed are located at the following towns and villages for improvement in breed and milk yield of the cattle and buffaloes of the urban and surrounding areas :—

Area	*Hallikar* Bulls	Buffalo Bulls
Bangalore	1	..
Hebbal	1	..
Mysore	2	1
Kolar	1	1
Tumkur	1	..
Shimoga	1	..
Hassan	1	..
Dodballapur ..	1	..
Gundlupet ..	1	..
Chikmagalur ..	1	1
Kadur	1	..
Kunigal	1	..
Arsikere	1	..
TOTAL ..	14	3

The resources of Government are limited to meet the entire demand for breeding bulls in the State, but Rural Uplift Funds are also made available for purchasing suitable *hallikar* bulls for distribution to Village Panchayets. A step equally as important as the supply of suitable stud bulls is seen in the steps taken by the Civil Veterinary Department to castrate scrub bulls in the course of tours of the Veterinary Inspectors. Castration of scrub bulls is a regular feature at all veterinary hospitals and dispensaries. The total number of scrub bulls castrated during the year 1940–41, was 88,497. This procedure in course of time, will have as important an effect as the mere supply of good breeding bulls. Apart from this, it is a regular feature of the Civil Veterinary Department to arrange lectures and demonstrations in villages and *jatras* regarding better maintenance and breeding practices of cattle and other live stock of the raiyats. Moreover, the District Veterinary and Live-Stock Officers during all their tours and specially at the *jatras* inspect the bulls for quality and arrange for their purchase.

As many as 119 cattle fairs or *jatras* were held in the State during the year 1940–41, more or less throughout the year, but chiefly during the season, November to March, and the muster of cattle and buffaloes was 9,46,878 head. The total award of prize money given at these *jatras* amounted to Rs. 3,371–10–0, the number of awards being 800. This is a considerable progress from the 78 *jatras* formerly held, mustering a total of 40,000–50,000 head of cattle, with a relatively small amount of prize money. The purpose of holding exhibitions and offering prize money is chiefly to foster and stimulate interest in the breeding of good stock. The Imperial Government always with a view to improving the live-stock of the country, has been holding annual exhibitions at New Delhi; as distances are rather great from one part of the country to another, the All-India Cattle Show has now been divided into Regional Shows, Western, Southern and Northern; the Southern regional show was recently held at Bangalore.

Hallikar cattle were originally introduced into Mysore by the tribe of *Gollas* from the North; it is curious that the name *Golla* has disappeared, while the cattle are known by the name, *hallikar*, after a sub-tribe of the *Gollas*. *Hallikar* cattle are to be found in the Tumkur, Hassan, Mysore and Mandya Districts, the chief centres being parts of Nagamangala, Kunigal and Gubbi Taluks. These have no extensive pastures like the *amrit mahal*, are sparsely populated even in these tracts and are house-fed by the well-to-do raiyats, who keep only a few cows; but special attention is paid to the mating of the cows and rearing of the young stock. This breed forms the basis of the better type of cattle throughout the State, justly famed for its high draught qualities. Variations of the *hallikar* breed of cattle are found in the *Gujmavu*, as opposed to the variations of the *amrit mahal* breed found in local breeds of *Hagalvadi* and *Chitaldrug*. The contrasting characteristics of the *amrit mahal* and *hallikar* breeds are furnished below:—

Amrit mahal	*Hallikar*
Colour.—Varies from light to deep grey with a darker shade, sometimes black, over the shoulders and hind quarters in bulls. Cows are usually more lightly coloured.	Dark to light grey with light patches about the face and dewlap. Cows are usually light grey though darker shades are not uncommon.
Head.—Well shaped with usually a black muzzle. Forehead not bulged and without a deep groove. Horns light to dark in colour, taking off far apart from the frontal bones and inclining backwards and outwards and then sweeping forwards in a bend. Sometimes they continue to grow outwards and inwards, the points being black and sharp. Eyes are small, quick and intelligent and sometimes blood-shot. Ears are small and tapering, usually carried in a horizontal position.	Long, lean and clean cut. Forehead bulges considerably giving rise to a perpendicular groove between the bulges of the frontal bones. Horns spring perpendicularly close together from the head; the frontal bones being extended to form their base make two longitudinal ridges at the upper portion of the head. The horns are usually dark in colour, spring up, inclining backwards and outwards for nearly half their length and then bend forwards, incline inwards and occasionally outwards towards their points. Eyes are quick and intelligent. Ears are small and well set up; muzzle fairly broad, usually black and occasionally black and white.
Neck.—Long, thick for size and sinewy.	Short, well muscled, thin and sinewy.
Dewlap.—Well developed.	Usually thin, not extending very far back.
Hump.—Well developed in bulls, smaller in cows.	Well developed but smaller than in the *amrit mahal* in proportion to size of animal.
Belly.—Long, well rounded with deep and full sprung ribs and chest.	Long but not deep, not of great width when viewed from above and behind. A fairly common fault of the breed is a tight appearance behind the elbow.
Back.—Strong, broad and straight, sometimes sloping to the hump, fall of the croup is usually gradual.	Falls slightly from the hump for a distance of 6 to 8 inches and rises gradually back to the croup, whence it falls abruptly. There is usually a prominent spinous process of the sacrum.
Quarters.—Well muscled and deep.	Well muscled but not remarkably deep.
Legs.—Short, clean, strong and sinewy, standing well apart. Shoulders are well developed and fore-limbs free in movement.	Light and clean bound. Forearm usually shows only slight development, the knee is small. Hind legs usually inclined to be straight at the locks and with commonly a slight tendency to turn outwards.

Amrit mahal	*Hallikar*
Feet.—Small, well formed, black and hard with close cleft between.	Small, firm and hard. Hind feet are more erect in the walls than the fore-feet and usually smaller.
Sheath.—Slightly pendulous in some types, tucked up in others.	Well tucked up.
Tail.—Thin and tapering, terminating in a very bushy tuft of black hair below the hocks.	Fine, reaching the hock when it gives rise to a tuft of fine hair.
Height.—Average: 50 inches.	Average: 52 inches.
Girth.—Average: 68 to 70 inches, sometimes slightly more than *hallikar*.	Average: 60 to 65 inches.
Remarks.—*Amrit mahals* begin to grow appreciably after 5 years, reaching their prime in 8 to 10 years. Bullocks capable of fast trotting work till 12 to 13 years.	The *hallikar* has much in common with the *amrit mahal*, but forms the better kind of cattle in the State. A certain amount of blood has diffused through sale and distribution and by passage of *amrit mahal* herds from place to place in the rotation of pasture lands. Hence, variation from the *hallikar* type are not uncommon.

Methods for Improving Paddy Production in Mysore*

As far as the paddy crop is concerned our Mysore State is in deficit to the tune of 12½ to 22 lakhs of pallas of paddy costing about 50 lakhs to one crore of rupees according to market fluctuations. That it has been so for the past so many years is evident from the figures given in Statement I.

STATEMENT I

Total imports of rice and paddy for thirteen years,
1926–27 *to* 1938–39

Year	Rice	Paddy	Year	Rice	Paddy
1926–27	1265174	60069	1933–34	1238132	9395
1927–28	1462805	20515	1934–35	2048339	24657
1928–29	1630642	7492	1935–36	2259381	17262
1929–30	1483085	22730	1936–37	1350207	8670
1930–31	1110397	41445	1937–38	1183572	3955
1931–32	1206855	10677	1938–39	1569015	21253
1932–33	1356405	27423			

Though the area under paddy and the total production of paddy have more or less increased during the above period as shown in the statement given below, the net import of paddy has not decreased much, on account of the increase in population year to year.

STATEMENT II

Paddy production

Year	Acreage	Yield	Acre yield	Year	Acreage	Yield	Acre yield
1926–27	702506	3462866	4·1	1933–34	774397	4573170	5·9
1927–28	704376	3547447	5·1	1934–35	679907	3466731	5·1
1928–29	707470	3978680	5·1	1935–36	740994	4225749	5·7
1929–30	720825	4079899	5·6	1936–37	726388	4377257	6·02
1930–31	742761	4421372	5·95	1937–38	707670	5251356	7·4
1931–32	731300	4069498	5·56	1938–39	732833	3920613	5·2
1932–33	770277	4706579	6·1				

* Paper read by Mr. S. V. Sharma, Senior Assistant Botanist, Paddy Scheme, on 21–12–1941, at the Field Day of the Agricultural and Experimental Union.

The main places from which rice is imported to India are Burma, Siam and Indo-China. Owing to the present War and present international condition, rice from Siam and Indo-China are not being received in India. It is quite possible that the Burma rice may not also reach India, to the extent it is being received all these years. The rice trade of Burma which was in a chaotic condition so long, is now receiving the attention of the Government. The unhealthy competition in the rice trade is to a very great extent put down. Arrangements are underway to monopolise the trade and fix an economic rate by the Burma Government. An export tax of Re. 0-2-9 per maund has already been imposed. Due to shortage of cargo ships and other reasons, the shipping freight on rice has recently been nearly doubled. It is also rumoured, that Burma is looking for a better market for her rice. So if we do not make arrangements to grow more food in our State to meet our increasing demands, we may be met with food shortage at no distant date. "Grow more rice" has been the slogan of the Imperial Council of Agricultural Research who have now come forward to subsidise any of its constituent Provinces and States, for developing rice cultivation, *i.e.*, introducing improved seeds and better cultural practices among cultivators, so as to increase their out-turn per acre. In our State also, the Government have already taken this question on hand and a scheme costing a lakh of rupees, spread over five years, has been sanctioned for taking special measures for increasing the production of paddy especially in such of those taluks having an area of 10,000 acres and more, under paddy every year. Considering the fact, that at present the average out-turn of paddy per acre is as low as 6 pallas in our State, all these years, it is quite possible to increase the yield at least by another two to three pallas, by using improved seeds and adopting improved methods of cultivation. As at present total paddy area is about 7½ lakhs of acres, which may go up to nearly 10 lakhs in the near future, an increase of two to three pallas per acre will surely balance this deficit. That it is possible to raise the average yield at least to this extent, has been already proved by the Department, by the various methods advocated by it. A perusal of the statement of yields obtained on the Nagenahalli Paddy Breeding Station, from year to year since 1929–30, will show to what extent the yield of the Farm has increased during these years, by the use of improved seeds alone.

STATEMENT III

Total paddy yield on the Nagenahalli Paddy Breeding Station, year to year, from 1929–30 *to* 1940–41

Year	Total yield in seers	Yield per acre in seers	Year	Total yield in seers	Yield per acre in seers
1929–30	47,476½	1,187	1935–36	56,874	1,422
1930–31	44,123	1,103	1936–37	59,626	1,490
1931–32	47,665	1,192	1937–38	57,139	1,438
1932–33	56,127½	1,403	1938–39	58,547	1,464
1933–34	46,757	1,169	1939–40	61,005	1,525
1934–35	57,512	1,434	1940–41	61,248	1,531

The yield per acre which was 11·87 pallas in 1929–30, gradually rose up to 15·31 pallas in 1940–41. So, the use of improved strains is one of the methods of increasing the average yield. By laying a number of demonstration farms throughout the State, for the demonstration of the improved varieties, the Department has shown to the raiyats, how much extra yield can be got by using these strains. Some spectacular yields obtained by some of the raiyats, who used these strains, are furnished below (Statement IV), just to show what is possible under ideal conditions.

Crop yield can be increased by judicious and liberal manuring. Due to war conditions, oil seeds, especially, groundnut, have been held up in various places for want of foregin market. A campaign has already started to reduce the area under this crop. The groundnut oilcake which was selling at Rs. 70 to Rs. 80 per ton is now available for about Rs. 30. I should consider that this is the fortunate time for our agriculturists. A cheap and rich manure which was going out in abundance all these years, is now available to us. Why not we take full advantage of it, and give liberal doses of the cake to our paddy plots? It will not only give good returns but the soil condition also will improve. Though it may not be possible to give a full dose of superphosphate due to war conditions, at least, a half dose may go a long way to check the unnecessary vegetative growth and give better ear-heads. As different lands require different treatments, it is not possible to discuss the problems of manuring here. A statement hereunder given (Statement V) shows some outstanding yields obtained by some raiyats who had manured their lands judiciously under the advice of the Department.

Statement IV

Results of Demonstration Plots—Use of Improved Seeds

Sl. No.	Taluk	Village	Name of grower	Strain number	Grain yield per acre in seers	Grain yield per acre in seers of local paddy
1	Kumsi ..	Ayanur	Nagappa	S. 684	3,200	2,000
2	Tumkur ..	Heggera	Gopal Krishnaiah	S. 684	2,560	1,600
3	do. ..	Thumbadi	B. S. Krishnamurthi	S. 547	3,840	3,040
4	do. ..	do.	do.	S. 317	3,040	2,000
5	Madhugiri ..	Siddanahalli	V. Subba Rao	S. 547	3,600	2,520
6	do. ..	do.	do.	S. 317	2,520	..
7	do. ..	Hosakere	Bommanna	S. 547	3,333	2,283
8	do. ..	Byalya	Gurappa	S. 547	3,200	2,800
9	do. ..	do.	do.	S. 317	2,800	..
10	do. ..	Doddandur	Bhakthar Saheb	S. 547	2,680	2,200
11	do. ..	Dodderi	Thimmiah	S. 547	4,130	3,000
12	do. ..	do.	do.	S. 317	3,000	..
13	do. ..	Chinakavajra	Venkategowda	S. 547	3,428	..
14	Tumkur ..	Kambadahalli	Prabhakariah	S. 547	3,200	2,000
15	do. ..	Tumkur	T. D. Venkataramiah	S. 705	2,520	..
16	Bowringpet ..	Ganjarapalli	Karapatti Rangiah Setty	S. 683	2,514	..
17	do. ..	do.	Nagegowda	S. 683	3,500	..
18	Sira ..	Bukkapatna	C. Muddappa	S. 705	3,325	2,400
19	Madhugiri ..	Bommanahalli	Venkateshappa	S. 705	2,746	1,666
20	do. ..	Hosadurga	Beemasena Rao	S. 705	3,733	2,333
21	do. ..	Chikkanahalli	Bhargawan	S. 705	2,566	..
22	Turuvekere ..	Turuvekere	D. Krishnappa	S. 705	2,720	2,520
23	Bangalore ..	Kaikondahalli	Gundappareddi	S. 705	3,600	..
24	do. ..	do.	Narayanareddi	S. 705	3,200	..
25	Hoskote ..	Hoskote	Appajappa	S. 317	2,528	2,400
26	Kortagere ..	Kortagere	Hariharagowda	S. 705	2,670	2,200
27	Kunigal ..	Shanbhoganahalli	Kallandarsab	S. 705	2 600	1,940

STATEMENT V

Results of Demonstration Plots (Paddy Manurial Trials)

Sl. No.	Taluk	Village	Name of grower	Grain yield per acre in seers
1	Anekal ..	Muthanellur	Muniswamireddi	2,880
2	Holenarasipur ..	Mallasamudra	S. Narasimhachar	2,900
3	Frenchrocks ..	Devegowdana Koppal	Kethumarigowda	2,600
4	Krishnarajpet ..	Palagrahara	Muddegowda	2,800
5	Chickaballapur ..	Bommanahalli	Thananarayana Setty	2,592
6	Chintamani ..	Thalagawara	Venkatarayappa	2,560
7	do. ..	Bikandahalli	B. S. Krishna Rao	2,954
8	do. ..	Mindagallu	Rangachar	2,592
9	do. ..	Gowripalli	G. Ramappa	3,200
10	do. ..	Kasettipalli	Venkataramareddi	2,784
11	Tukmur ..	Hutchuveeranapalya	Honnappa	3,600
12	Koratagere ..	Koratagere	Narasinga Rao	2,800
13	do. ..	do.	Hanumantha Rao	3,600
14	do. ..	do.	C. Ramaiah	3,200
15	Madhugiri ..	Gujjanadu	Venkatesiah	3,200
16	Sira ..	Chicknahalli	Patel Ramagowda	2,566
17	do. ..	Bukkapatna	C. Muddappa	3,200
18	Krishnarajpet ..	Madahalli	Kalegowda	2,512
19	Srinivaspur ..	Aramakalhalli	Y. N. Vasudeva Rao	2,600
20	Hosakote ..	Hosakote	Appajappa	2,800
21	Koratagere ..	Koratagere	Hariharappa	2,900
22	Krishnarajpet ..	Gaddahosur	Kalegowda	2,512
23	do. ..	Muddanahalli	Shanbhogh Thammiah	2,624

Another point which we should not lose sight of is the seed rate per acre. At present the seed rate of paddy varies from 32–80 seers, nay even 100 seers, per acre. This is wasteful. If good well matured seeds, properly dried, and well preserved, are used, anything more than 15–20 seers will be unnecessary. That this seed rate is more than enough, has been demonstrated to the raiyats in many places. In spite of this, raiyats may not reduce the seed rate all of a sudden; they can very well reduce it by half. At a very modest estimate the saving thus effected at 20 seers per acre will be two lakhs of pallas, which is not a small quantity to be neglected.

One more point I would like to impress is double cropping on the same land in one year. Where water is available two crops can be taken on the same land during summer and rainy seasons of one and the same year. Our raiyats are under the impression that continuous cropping will damage the fertility of the soil and make it unfit for cultivation ere long. If proper cultivation is done and both the crops are well manured, the land cannot get bad. Taking two crops or even three crops of paddy a year is not uncommon. In South Canara, Malabar, Trichinopoly, Tanjore, Godavary and Krishna Districts of Madras Presidency, Cochin and Travancore States, this practice is not uncommon. In the West Coast, two crops are harvested successively by using short duration paddy varieties during the monsoon season alone. Even in our State double cropping is practised to a small extent. At Rupanagrahara village, Bangalore Taluk, for example, Subvention Farms for the Rainy Season and the Summer Season were laid out on the same plot, the Summer crop following that of the rainy season. That the yield has not in the least been affected adversely is seen from Statement VI.

Under big tanks like that of Hoskote, only one crop generally of summer variety is taken. During the rainy season the land is left fallow. Why a second crop is not possible during the rainy season requires investigation. Even in Bannur area, where water is plentiful during the rainy season, on account of the *nala* systems, a second crop is not now taken in the *Kar area* blocks. By economic use of water in the channels, it is quite possible to take a second crop on these lands during the rainy season. The Department has evolved short-duration strains, such as, S. 705, S. 317, etc., which may be used for raising two crops successfully. Even within the seven months, June 10th to January 10th, when continuous supply of water is available in the channels, two successive crops of short duration, as in the case of Malabar and other West Coast districts may be raised. Whether this is possible under our conditions is also a matter for investigation.

The various strains of paddy evolved by the Department have already been described in the Agricultural Calendars and separate publications. Some of these have become very popular in the districts, and about 6,500 pallas of improved seeds were distributed during this year. In order to bring home to the raiyats the benefits of the methods advocated by Agricultural Department about 150 Subvention Plots and a large number of Demonstration Plots, have been laid in the raiyats' fields throughout the paddy tracts, 23 central seed farms and 217 seed ' A ' farms, have also been laid to meet the increasing demand for seeds next year.

With the facilities now afforded by our Government and the Department, it is hoped that our raiyats, especially in the paddy tracts, will pay heed to the suggestions given above and help to increase the output per acre. Now that the rice rates are going up, they will not only be getting good income, but will also contribute to the stoppage of import of rice, and save for our country the sum of Rs. 50 lakhs to one crore, which is now going out.

STATEMANT VI

Results of Paddy Subvention Plots conducted in the Fields of Mr. Adugodi Ramiah at Rupanagrahara, Bangalore Taluk, in the same plots continuously

Rainy Season									*Summer Season*							
Sl. No.	Name of paddy varieties	Date of Sowing	Date of Transplanting	Date of Harvesting	Duration from the date of Transplanting M.	Duration from the date of Transplanting D.	Yield per acre Grain in seers	Yield per acre Straw in lbs.	Sl. No.	Name of paddy varieties	Date of Sowing	Date of Transplanting	Date of Harvesting	Duration from the date of Transplanting M.	Duration from the date of Transplanting D.	Yield per acre Grain in seers	Yield per acre Straw in lbs.
1	S. 661	29-6-40	28-7-40	11-12-40	4	15	2,560	5,000	1	S. 317	25-1-41	26/27-2-41	9-6-41	3	11	2,240	5,748
2	S. 667	,,	,,	28-12-40	5	..	2,464	8,288	2	S. 547	,,	,,	15-6-41	3	17	2,182	4,668
3	S. 246	,,	29-7-40	6-12-40	4	7	2,400	8,255	3	Local Halubbalu	,,	,,	18-6-41	3	20	2,080	5,384
4	S. 139	,,	28-7-40	27-12-40	5	..	2,400	8,008	4	S. 705	,,	,,	1-6-41	3	2	2,040	5,218
5	S. 699	,,	,,	14-12-40	4	15	2 385	5,273	5	S. 396	,,	,,	15-6-41	3	17	942	1,595
6	S. 476	,,	29-7-40	4- 1-41	5	5	2,066	5,323									
7	S. 199	,,	28-7-40	27-11-40	4	..	1,920	5,600									
8	Local Halubbalu	,,	29-7-40	23-11-40	3	25	1,714	3,428									
9	S. 624	,,	,,	18-12-40	4	19	1,520	3,723									

N. B.—The actual quantity of paddy obtained on the whole area of 2¼ acres: Rainy Season .. 4,848 Seers
Summer Season .. 4,424 ,,

Total quantity obtained for the year .. 9,272 Seers
or 4,120 Seers per acre.

The Agricultural Colony*

I am much obliged for this opportunity given me to tell you about the experiences of our newly instituted Agricultural Colony and I hasten to tender my grateful thanks to the President.

On behalf of my brother colonists and myself it is my pleasant duty to convey our gratitude to the Government for having initiated this scheme of properly capitalised and scientifically administered system of agricultural business and solving the unemployment problem of the educated class by releasing the Government waste lands for cultivation with monetray support, in the Irwin Canal area. We are indebted to our Director of Agriculture, for the paternal care bestowed on us in our new profession.

We now feel confident that our concern is being piloted in safe waters to success.

Our Deputy Director with this ever exuberant enthusiasm bearing all the troubles of an eleventh colonist—there are ten colonists in the enterprise—has been with us ever since June 1940 devoting most of his time for our welfare and uplift and I cannot adequately express our gratitude to him.

We commenced work on the 10th of July 1940. By this time the lands were tractor-ploughed and kept ready. With co-operation and mutual aid, we were able to transplant 15 acres of tobacco by the end of July and another forty acres by the end of August, besides sowing fodder crops like jola and horsegram for cattle.

The initial difficulty of preparing land was solved a great deal for us. Compost was transplanted from Mysore and the Irwin Canal Farm by lorries. We built small thatched sheds for our residence. We were gradually trained to face exposure to wind, rain and sun and work hard on our fields. On the lines laid thus, we were allowed to proceed further. In all we raised 95 acres of tobacco in the first year besides vegetables and certain other crops to find out their suitability to soil and climate of the locality.

Subsequently we got the land ready for the next year's cropping by sowing soil-renovating green manure crops. In the first cropping season we were successful in our object of reimbursing the cultivaion advance of Rs. 5,00 granted to us by Government that was spent in the first year's cropping, besides providing a lumpsum for our coming year's maintenance and for the land improvement by terracing and bunding.

Our aim in the 1941 season was to raise cereal crops like paddy and ragi for our food, vegetables and onions for our clothing and extra expenses and commercial crops like cotton and tobacco to pay Government dues. Under

---

* Paper read by Mr. Byatarangappa, Colonist, on 21-12-1941, at the Field Day of the Agricultural and Experimental Union.

this arrangement 5 acres belonging to each colonist went under cotton, three acres under paddy and ragi, half an acre under miscellaneous crops and the rest under tobacco.

It is not out of place to mention the financial aspects of our crops. I spent the following amount to raise five acres of tobacco for the first time:—

TOBACCO (*on the first five acres*)

Artificials	Rs.	160	@ Rs.	32	per acre
Compost 10 tons	„	60	„ „	12	„
Seedlings	„	45	„ „	9	„
Labour Charges	„	100	„ „	20	„
TOTAL ..	„	365	„ „	73	„

I supplied 24,000 lbs. of green leaf of tobacco to the Mysore Tobacco Company, Ltd., for Rs. 600 realising a net income of Rs. 235 or Rs. 47 per acre. In the second season the details for 2½ acres are as follows:—

Artificials	Rs.	80 0 0	@ Rs.	32	per acre
Seedlings	„	22 8 0	„ „	9	„
Compost	„	30 0 0	„ „	12	„
Labour Charges	„	40 8 0	„ „	16-3-0	„
TOTAL ..	„	173 0 0	„ „	68 3 0	„

Against this, I supplied 12,500 lbs. of green leaf for Rs. 312–8–0. The net income per acre works up to Rs. 55.

In the current season my returns per acre of tobacco have progressed to Rs. 200 (gross) in June and July plantings, the yield of green leaf being 10,500 lbs. per acre. I am confident that an earnest and judicious cultivation of tobacco will result in an average net return of Rs. 75 per acre.

The cultivation expenses of cotton are as follows:—

COTTON (on 4½ acres)

Green manuring	Rs.	22 8 0	@ Rs.	5	per acre
Compost	„	50 0 0	„ „	11	„
Oil-cake	„	32 0 0	„ „	7	„
Labour Charges	„	144 0 0	„ „	32	„
TOTAL ..	„	248 8 0	„ „	55	„

I have obtained 185 maunds of cotton and at Rs. 4 per maund, the income is Rs. 740. Deducting expenses, I have realised Rs. 109 net per acre in addition to 900 seers of ragi and 860 seers of groundnuts as intercrops in cottton.

I have grown sufficient corn for my living and the proceeds of onions and vegetables have provided me with clothing and daily family expenses.

Details of onion cultivation are as follows:—

Seeds 2 seers	Rs.	2	0	0
Nursery	„	3	0	0
Preparatory cultivation ..	„	10	8	0
Manure	„	50	0	0
Labour	„	30	0	0
TOTAL ..	„	95	8	0

N.B.—On an average a good crop yields 400 maunds of an ordinary value of Rs. 300 resulting in a net income of Rs. 200 per acre within a course of 3 months.

From experience it is found that alternative short-season crops like gram, coriander and wheat will thrive well enough.

In conclusion, it seems to me that Agriculture as a business proposition is sound enough to render a secure living to an individual. It does contribute to an ideal life with sacrifice and silent toil peculiar to it.

I am sure you will agree with me that my friends are not ill advised when I canvass them to take up agricultural colonisation chances, started by our benign Government with the advice of our distinguished President.

I feel happy to invite the members of the Mysore Agricultural and Experimental Union to go over to our Colony to see us in our environment. One of the Annual Meetings may be arranged there to provide this opportunity.

A Brief Note on the Development of the Poultry Section

By

S. B. Vasudeva Rao, L.V.P. (Hons.)

The Poultry section of the Veterinary Department is the youngest arm of the Service and at present consists of fourteen separate farms, each self-contained and working in different districts. All the farms deliver their produce of eggs to one Central Station for accounting, recording and distribution.

Of these fourteen units, six are located on Agricultural Farms, and have good scope for future expansion; the rest are propaganda and demonstration farms and are located in the Veterinary Hospital premises in such places where there is ground available for keeping poultry. It is the aim of the Department to keep at least a 100 layers in each of these units. The poultry units on the Agricultural Farms are thriving well as there is free range, and area for giving rest to lands under poultry, which is very necessary for successful poultry raising and the department intends to have at least 200 to 300 layers in such units so as to eventually make them commercial farms. The policy of the Department is to make available a large number of fertile eggs and cockerels to the rural folks at a moderate price for raising birds for themselves, and for cross-breeding purposes with village poultry. It is also intended to make the main farms self-supporting. A few agriculturists who could set by a portion of their land mainly for poultry, get their foundation flock in the form of two-month-old pullets at a moderate price from the main station. Annually an average of six such private farms are springing up near Bangalore. On Bangalore-Mysore road, there are three Government farms located one each at Closepet (Rural Welfare Centre), Somanahalli (near Maddur) and Nagenahalli (near Mysore).

The farm at Closepet Rural Welfare Centre has at present nearly 100 laying birds of Rhode Island and Leghorn breeds. Hatching and brooding of chicken is done by artificial means. The Somanahalli Agricultural School has a stock of Rhode Island Red and White Leghorns mainly for the purpose of demonstration to students. It is intended to make this a commercial farm in the near future. The Nagenahalli farm keeps Rhode Island Reds and hatches chicken by natural means under broody hens.

The raising of Black Minorca chicks, requirng special care by themselves, has been delegated to the Cattle Breeding Station at Hunsur, 28 miles from Mysore, on the Mysore-Coorg Road. An exclusive Black Minorca farm may be said to have come into existence there.

There are two farms on the Bangalore–Dodballapur Road, one at Hebbal, 5 miles from Bangalore and another at the Rural Welfare Centre,

Dodballapur. On both these farms chicken are hatched by incubators and raised in battery brooders. The stocks consist of Black Minorca, White Leghorn and Rhode Island Red breeds. Fertile eggs could be had during the season from July to December from a single setting to 20 dozen eggs for incubation, with due notice. Other farms are located at Chikkanhalli Agricultural School, Sira Taluk, Garudapalya (Narasapur Post) on Bangalore–Kolar Road, Kolar, Hassan, Shimoga and Yellachihalli.

The total strength of layers on all these farms is a thousand and annually on an average, 1,000 cockerels, 6,000 fertile eggs and 500 chicks are sold to the public for stock raising at a very moderate cost. On a total about 75,000 eggs are produced which are sold for table purposes. A thousand pullets are raised for replacement of stock as well as for further extension of poultry farming. The main units located on Agricultural Farms are self-supporting.

The Agricultural Department while distributing fertile eggs, chicken and stock keeps a careful watch over the industry, through the Mysore Poultry Association, which is a demiofficial body. The Association includes among its objects (1) rendering help to its members to successfully raise their poultry, (2) marketing the produce for them at the best prices, (3) holding poultry shows, and (4) arranging demonstrations and lectures. The membership of the Association is open to Mysoreans and also neighbouring non-Mysoreans who are in any way interested in this profitable and absorbing hobby.

The Twenty-second Annual General Meeting and Field Day of The Mysore Agricultural and Experimental Union, Bangalore

The Twenty-second Annual General Meeting of the Mysore Agricultural and Experimental Union was held at the Government Experimental Farm, Hebbal, on 21st December 1941.

Field Day and Exhibition

The members went round the fields and the exhibition arranged for the occasion, in the morning. Besides the Departmental exhibits including charts and maps showing the development in the recent works taken on hand by the Department of Agriculture, good samples of ragi plants with earheads (*Elucine coracana*), *navane* earheads (*Setaria italica*), jola earheads and cotton were also contributed by one of the members of the Union from Arsikere, M.A. II and Co. 4 cotton crops which had yielded more than 25 maunds to the acre were to be seen in the dry area of the Farm and a good stand of sugarcane including seedlings under study and standard canes in statistical plots in the wet area. The preparation of *boora* sugar by rubbing in the open pan and of crystal sugar in the centrifugal was keenly watched by the members. The working of the tractor and the poultry and dairy yards were other attractions. A few of the members visited the Serum Institute close by.

Business Meeting

The hall of the Sheep Expert's Office was placed at the disposal of the Union for the assembly. The business meeting commenced at 2 p.m.

Rajasevasakta Prof. B. Venkatanaranappa, the Vice-President of the Union, then moved the following resolution after a few words of appreciation:—

"The members of the Mysore Agricultural and Experimental Union, assembled at the Annual General Meeting of the 'Union' held at the Government Experimental Farm, Hebbal, on Sunday, the 21st December 1941, have much pleasure to congratulate their President, *Rajasevaprasakta* T. G. Rama Iyer, B.A., Director of Agriculture in Mysore, on the title of '*Rajasevaprasakta*', graciously bestowed upon him by His Highness the Maharajah of Mysore, in October 1941, and pray that the Almighty may shower on him His choicest blessings to enable him to continue the very good work that he has been doing in the best interests of agriculture in Mysore."

The resolution was passed with acclamation.

The Secretary then read his Report which was duly adopted by the members present. It is printed elsewhere in this issue of the Journal.

The following resolutions were then passed by the assembly unanimously:—

" *Resolved* that the gratitude of the members of the Mysore Agricultural and Experimental Union be conveyed to the Government of His Highness the Maharajah of Mysore, for the continued patronage they have been extending to the Union and that a request be made for increasing the amount of subvention to Rs. 3,000 per annum for a further period of five years, so that the Union may cope up with its increased responsibiilties."

" *Resolved* that the gratitude of the members of the Mysore Agricultural and Experimental Union be conveyed to the Revenue Commissioner in Mysore, for having recommended the Kannada *Journal* of the Union to all the Village Panchayats and request that he may kindly reconsider arranging an annual grant from the Rural Reconstruction allotments for the free distribution of copies of the *Journal* to selected Village Panchayats."

" *Resolved* that the Director of Public Instruction in Mysore be requested to kindly continue the patronage of the Education Department and recommend the Kannada *Journal* of the Union to all the middle and upper primary schools and permit the subscribing schools to come into closer touch with the Union by formation of agricultural clubs as an extra-curricular activity."

In order to clearly define the arrears of subscription, a sentence was added to Clause 8 of the Constitution and Rules of the Union, as follows:

" The annual membership subscriptions are payable in advance and subscriptions will be considered to be arrears if they are not paid during the year for which they are due."

The amendments suggested by Mr. B. V. Venkatacharya were discussed:

The sentence in Clause 10 reading " The Director of Agriculture and the Deputy Director of Agriculture shall be *ex-officio* members of the Committee of Management " was amended to read " The Director of Agriculture, the Deputy Director of Agriculture, and the Superintendent of Veterinary Services shall be *ex-officio* members of the Committee of Management."

The last para of Clause 14 *b* was retained as such, reading:

" Members who are in arrears of their subscription for more than 3 months at the time of the meeting shall not be entitled to vote or bring up subjects for discussion or resolutions for adoption."

The propositions tabled by Mr. Veere Gowda of Malavalli were withdrawn by the mover and that of Mr. H. V. Subramanyam was dropped after a discussion of *pros* and *cons*.

Mr. B. Sreenivasa Iyengar's proposition that ' the Associateship fee that is now stipulated as eight annas be reduced to four annas per year when

it will be possible to enlist a large number of Associates in each taluk" was supported by Mr. K. H. Sreenivasan and passed. His other proposition to link up the sheep breeding and poultry associations with the Union was withdrawn by the mover.

The elections to the Managing Committee were then held and the following persons were returned.

PRESIDENT

Rajasevaprasakta T. G. Rama Iyer, B.A., Director of Agriculture in Mysore.

VICE-PRESIDENT

Rajasevasakta B. Venkatanaranappa, M.A.

EX-OFFICIO

Mr. M. J. Narasimhan, B.A., Deputy Director of Agriculture.
Mr. S. D. Achar, G.B.V.C., P.G. (Punjab), Superintendent of Veterinary Services.

MEMBERS ELECTED

Mr. S. Venkataswamy Gowda, Santhehally, Malur Taluk.
Mr. G. Venkataramaniah, Bangalore.
Major C. B. Oakley, V.D., A.M.I.M.E., Bangalore.
Mr. B. V. Venkatacharya, B.Sc. Agric., Alakere, Mandya.
Mr. M. G. Rama Rao, Chickballapur.
Mr. B. Shankara Rao Badami, M.A., Bangalore.
Mr. T. Lakshmana Reddi, Sabbanahally, Goribidanur.
Mr. V. N. Muniswamappa, Viswanathapur, Devanahally.
Mr. D. S. Ramiah, Devanahally.

SECRETARY

Mr. M. Vasudeva Murthy, B.Ag.

Mr. S. A. Gangadhara Sastry, M.A. (Litt.), LL.B., M.A. (Com.), G.D.A., etc., Government Certified Auditor, was elected to audit the accounts of the Union for 1941–42 also.

At this stage the President delivered a speech depicting the current agricultural developments. Mr. Venkataswamy Gowda proposed a vote of thanks to the Chair. The President left the assembly on other engagements and the Vice-President, *Rajasevasakta* B. Venkatanaranappa, took the Chair for the further conduct of the assembly.

INFORMATIVE TALKS

A number of subjects were tabled for short talks by representative workers. The following persons spoke on their several subjects:—

Mr. A. Anantapadmanabha Rao, B.A., Statistician	A Popular Account of Statistical Analysis.
Mr. B. Venkoba Rao, B.Sc., Senior Assistant Botanist in charge of Sugarcane Breeding Work	Sugarcane Breeding in Mysore.
Mr. Byatarangappa, L.Ag., Colonist	The Agricultural Colony
Mr. S. V. Sharma, Senior Assistant Botanist in charge of Paddy Work	Improvement of Paddy in Mysore.
Dr. B. T. Narayanan, B.A., Ph.D., Agricultural Chemist	Manuring of Crops in Mysore.

The meeting terminated with a vote of thanks to all those who had helped to make the Field Day successful and three cheers to His Highness the Maharajah of Mysore. M. V.

Report of the Secretary, The Mysore Agricultural and Experimental Union, Bangalore

Presented at the Annual General Meeting on
21*st December* 1941

I beg to submit the report of the Mysore Agricultural and Experimental Union, for the one year since the last General Meeting held in November 1940. We are now holding the Twenty-second Annual Meeting.

A happy event of the year has been the gracious conferment of the title of *Rajasevaprasakta* on Mr. T. G. Rama Iyer, the President of our Union, by His Highness the Maharajah of Mysore.

We are missing from our midst to-day one who was a long-standing member of our Union, Mr. M. S. Ramachandra Rao, B.A., B.L., whose death occurred recently. He was latterly serving on the Committee of Management of the Union and was a lively and enthusiastic personality.

We have now 254 members on our rolls as against 193 on 1–11–1940. The number of our members who are receiving our Kannada *Journal* and who are all practically agriculturists has risen from 61 to 104. The number of Officers of the Agricultural Department on the rolls has risen from 84 to 107.

The number of subscribers, in addition to the members, stands at 149 as against 134 on 1–11–1940. Our requests in the matter of enlisting Middle Schools and Village Panchayats were very sympathetically viewed by the Director of Public Instruction and the Revenue Commissioner in Mysore. There are at present 62 schools on our subscription lists as against 60 on 1–11–1940 and 40 Village Panchayats as against 26 on that date.

Experiments proper are being conducted on the raiyats' fields by the Agricultural Department and the present number of 180 subvention farms, 4,500 demonstration plots, 600 seed farms and 17 central seed plots, speaks for itself. As the Director of Agriculture has often pointed out the agriculturist members of the Union are requested to take advantage of all the schemes and co-operate with the Department in the advancement of the State's agriculture.

Our Journals remain the media through which the experimenters can speak. Several of them have made use of the coloumns but still many can send their contributions, however small the notes may be. A number of features have been introduced into the Journals under the guidance of our President, the Director of Agriculture, who has insisted on the raiyats' own results being given a prominent place. The members will feel the appropriateness of the feature being developed and their co-operation in this regard is earnestly solicited. The authorities approached have been particularly kind to us and to quote, just one instance, the Chief Marketing Officer to the Government of Mysore has promised to send market prices of commodities regularly for publication in the Kannada *Journal*. Beginning with the first issue of 1941–42,

the name of the English *Journal* has been changed to '*The Mysore Agricultural Journal*'.

While the publication of the Journals goes a long way, it is felt, as some of our members have expressed, the Union should extend its influence in other directions. The place that a function like the Field Day has in the members' minds is an indication of this. One of our members has suggested that Field Days should be held in villages. Indeed, this can be done if the members themselves find ways and means.

As reported in the last year's report also, many suggestions such as possession of a building by the Union, maintenance in the premises of the Union a library, a well-kept reading room and display of charts and illustrations and arranging lectures in the mofussil with the help of lantern slides, etc., have now and again been made by the members but the paucity of funds places severe limitations to our ambition.

The scheme of affiliated associations is in the constitution but no affiliated association has been formed yet. A large number of people can come under the influence of the Union by paying a very small fee if this scheme is developed. For example, if ten people can join in a locality they can form a local association. That association has to pay just an admission fee of rupees ten and an annual fee of rupees ten to the Union. If there are just ten members in the local association, the contribution per head will be just rupees two initially and rupee one annually thereafter to make up this amount, for which they can send two delegates to the Union and obtain two copies each of the English and Kannada Journals of the Union. If there are more members, the contribution each will have to make will be smaller. But the question is just whether the Union should wait till a local association forms itself and desires affiliation or should take an initiative in starting such associations.

Again there are others among our friends whom all of us would wish to be more closely associated with our Union. First, I refer to the students of the Mysore Agricultural School, Hebbal. We have made a special provision for them and yet the interest evinced has not been considerable. If the students set themselves to produce at least one good agricultural essay each, in the course of three years of their instruction and the Union be called upon to afford reference facilities to them and publish the essays, I believe a good association may be set up. The whole body of students may form a group, affiliated to the Union to this effect. It should not be a difficult matter.

Secondly, I refer to the large group of Veterinarians in our State. Recently the Superintendent of Veterinary Services has promised us to address all the Veterinary Officers, to send field-notes to be published in our Journals. On the animal husbandry side specially, these scientists come even closer to us and off and on several good articles have been contributed to our columns by them. This should indicate the possibility of these friends trying

to uphold this Institution to some extent. Just how this can be managed may be talked over if the principle is once accepted.

The Government of His Highness the Maharajah of Mysore graciously continued the grant of Rs. 2,000 for the year 1941–42 in their G.O. No. A.F.8397–8, Agri., 269–40–4, dated 18th May 1941. It needs no explaining that the functioning of the Union depends on a further continuation of the grant. In the last year's report it was pleaded that the grant may kindly be enhanced to Rs. 3,000. As members who have visited the premises to make use of the library of the Union know, a great deal more of equipment and perhaps additional staff is necessary. The present finances fall short of the requirements from all the three points of view, (i) the maintenance of the Union at the level of equipment to which it has been nursed these 22 years and more; (ii) the make-up of the Journals and (iii) any further measures of utility in consonance with the objects of the Union. It is before the General Body to request for an enhanced grant.

Mr. S. A. Gangadhara Sastry, Government Certified Auditor, has audited our accounts for the year 1940–41 and our thanks are due to him.

M. VASUDEVA MURTHY,
Secretary.

Balance Sheet as on 1-7-1940

LIABILITIES	Rs. A. P.	ASSETS	Rs. A. P.
Fund	1,253 10 9	Cash	598 11 3
Subscriptions received in advance:		Stamp	19 2 0
Rs. A. P.		Furniture and other stock ..	257 4 0
1. Members .. 71 8 0		Library	260 1 0
2. Subscribers .. 84 4 6			
	155 12 6	Sundry debtors for arrears due	28 8 0
Sundry Creditors for advances received	12 8 0		27 12 0
		Arrears outstanding :	
		Rs. A. P.	
		1. Members .. 212 8 0	
		2. Subscribers 24 1 0	
			236 9 0
TOTAL ..	1,421 15 3	TOTAL ..	1,421 15 3

Note.—Value of old issues of the Union journals as well as blocks, has not been taken into a/c. in compiling the above Balance Sheet, as a definite value cannot be fixed for these, in view of the fact that the blocks have served their purpose in illustrating the journals and the old copies are being distributed even free to members as per resolution of the Managing Committee. The Exchange Journals are not valued as they are received free and no charge is incurred on them except when binding. Stock registers are however maintained.

M. VASUDEVA MURTHY,
27th September 1941.

Income and Expenditure Account for 1940-41

Expenditure	Rs.	A.	P.	Income	Rs.	A.	P.
To Establishment	1,672	13	0	By Admission Fee	64	0	0
,, Printing	1,444	5	0	,, Membership Fee ..	594	0	0
,, Postage	127	2	9	,, Subscription	441	7	0
,, Books and Stationery ..	55	14	0	,, Advertisement	64	0	0
,, Miscellaneous Expenses ..	2	5	3	,, Associateship Fee ..	14	8	0
,, Meeting Expenses ..	91	8	0	,, Miscellaneous Receipts ..	2	14	0
,, Depreciation on Furniture ..	19	5	0	,, Interest	25	6	6
,, Auditor's Remuneration ..	25	0	0	,, Subvention for 1940–41 ..	2,000	0	0
Total ..	3,438	5	0	Total ..	3,206	3	6
				,, Excess of expenditure over income	232	1	6
Grand Total ..	3,438	5	0	Grand Total ..	3,438	5	0

(Sd.) S. A. Gangadhara Sastry,
Government Certified Auditor.

M. Vasudeva Murthy,
Secretary.

Balance Sheet as on 30-6-1941

Liabilities	Rs.	A.	P.	Assets	Rs.	A.	P.
Fund	1,253	10	9	Cash	537	2	6
Subscriptions received in advance:				Stamp	27	0	3
Rs. A. P.				Furniture:			
1. Members .. 75 0 0				Rs. A. P.			
2. Subscribers .. 134 15 6				Opening Balance .. 257 4 0			
	209	15	6	*Less* Depreciation @ 7½% .. 19 5 0			
Sundry Creditors	172	6	0		237	15	0
				Add Purchases during the year .. 6 12 0			
					244	11	0
				Library	260	1	0
				Arrears outstanding:			
				1. Members .. 254 8 0			
				2. Subscribers .. 51 12 0			
					306	4	0
				Sundry Debtors	28	12	0
				Excess of expenditure over income transferred from Income and Expenditure Account ..	232	1	6
Total ..	1,636	0	3	Total ..	1,636	0	3

I have examined the above Balance Sheet with the Books and Vouchers maintained in the Union and have obtained all the information and explanations required. In my opinion such Balance Sheet has been drawn up correctly and exhibits a true and correct view of the state of affairs of the Union as on 30th June 1941, according to the best of my information and the explanations furnished and as shown by the books of the Union. This certificate is subject to the remarks made in my separate report of date.

Bangalore,
28*th September* 1941.

S. A. Gangadhara Sastry,
M.A. (Litt.), LL.B., M.A. (Com.), &c.,
Govt. Certified Auditor.

M. Vasudeva Murthy,
Secretary.

SELECTIONS

Candling Eggs

Eggs are candled to determine their quality as shown by the condition of the air cell, yolk, and white. Candling consists of holding the egg before a strong light, usually artificial, in such a way that the rays of light penetrate the egg to a considerable extent, thus making it possible to observe the condition and behaviour of the contents. Most producers do not candle eggs, although buyers and dealers find it advantageous to do so. Where a high-class retail trade is being catered to by producers, candling is necessary, for some absolutely fresh, new-laid eggs are unsuitable for food and if delivered to the consumer will hurt the reputation of the producer. Such eggs are those with bloody whites, large blood spots and large meat spots. It is also desirable to remove where they can be detected, eggs with small blood spots or small meat spots, which, while not rendering the eggs inedible, do cause them to be considered of lower grade.

Home-made egg candles may be easily and cheaply constructed with any light sufficiently strong. An electric light is best, but a good kerosene lamp, a gas flame, or sunlight can be used. A satisfactory home-made candle can be constructed from a tin can of sufficient size to hold an incandescent lamp. The lamp cord should be run through a hole in the removable top of the can and a round hole, 1¼ inches in diameter, should be cut in the side of the can opposite the light filament. This makes a satisfactory home-made candle where electric light is available.

When being candled, the eggs are held in a slanting position with the large end against the hole through which the light passes. The egg is grasped by the small end, and while held between the thumb and tips of the first two fingers it is given one or two quick turns on its long axis. This causes the contents of the egg to move and throws the yolk nearer the shell, allowing its condition to be more carefully observed.

The egg must be turned so that its entire surface is exposed to the candler's view. Otherwise the only evidence of an undesirable condition might occur in that portion not observed by the candler, and the egg would be misgraded. For the same reason as little of the egg as possible should be obscured by the thumb and fingers holding it. The dark colour of the shells of brown eggs makes them more difficult to candle than white eggs. It is not necessary for producers to have extensive and detailed knowledge of candling, but they should be able to distinguish a fresh egg from a stale egg and to detect undesirable conditions. In a fresh egg the air space is small, measuring not over one-eighth inch in depth. The yolk should have an outline which is only moderately defined. There should be no visible development of the germ spot or other evidence of defects or blemishes on the yolk when the egg is candled. The white should be reasonably firm and should be free from foreign particles, such as meat spots or blood clots.

In a stale egg the air cell is larger, and the outline of the yolk is much more definite. The yolk usually moves more freely in the egg, and the white is generally

thinner or more watery. In a heated egg the germ spot is likely to show development, and the air cell is usually enlarged, although in some cases it may still be comparatively small. In such an egg the yolk is likely to be above the equator of the egg, and its outline is quite pronounced. The development of the germ spot is usually visible as a spot of more pronounced or reddish colour on the yolk. If a blood ring or blood veins are visible the egg is classed as inedible. Stale and heated eggs are of poor quality and are placed in a lower grade.

Fresh eggs may have bloody whites. Before the candle they can be distinguished by the red colour of the white and often by irregularly shaped bodies or blood clots generally on the surface of the yolk but sometimes floating in the white.

Foreign material shows as dark-coloured particles in the white, often called "meat" spots. Blood rings or veins indicate that the embryo has developed to a point where blood is visible. If the embryo or germ has died the blood usually collects in a ring or circle known as a blood ring. Such eggs are common during hot weather if fertile eggs are held at ordinary room temperatures for any considerable time. Eggs showing blood rings are classed as inedible.

Various other classes of eggs are unsuitable for food, such as stuck yolks, moldy eggs, and rots. Most of these are easily distinguished before the candle and are of interest to the producer only because they should not be sent to market and because their occurrence should be prevented. Eggs sometimes have minute cracks or blind checks that are invisible to the naked eye but are apparent before the candle. These should not be sent to market but should be used at home as they will not keep well and are more easily broken.

All handlers of eggs, from the producers to the city jobbers, should satisfy themselves of the quality of the eggs that they buy or offer for sale. This can be accomplished only by candling. In commercial packing plants the candling should be done by trained candlers in rooms maintained at a temperature of not over 65° F. The "Candle" used should consist of an electric-light bulb enclosed in a metal shield which should have only one hole, against which the eggs are held for candling.

The candler stands before the light, which should be fastened at a convenient height, usually 38–44 inches from the floor. He handles the eggs very rapidly. At his side or directly in front on a shelf 22–26 inches high, is placed the case of eggs to be candled. After removing the top packing the candler lifts the first filler out of the case, leaving the eggs lying loose on the next flat. He picks up the eggs, two in each hand. After candling one egg in each hand, by a quick manipulation of the thumb and fingers he reverses the position of the eggs and candles the other egg in each hand. As the eggs are candled they are graded and each egg is placed in the proper case for its grade, such cases being placed on the candling bench in locations convenient to the candler. At concentration points it is customary to pack the eggs after candling in new packing materials and in new cases. The average candler, working at a steady pace but without undue effort, should candle from 18–25 cases of eggs in an 8-hour working day. Storage eggs and others of uncertain quality should always be recandled in the final distributing and consuming markets before they are offered to the retail trade. It is customary to recandle most other eggs in the consuming market, although more and more effort is being made to candle the eggs at country shipping points in a

sufficiently careful and satisfactory manner so that recandling at the consuming market will be unnecessary.

In learning to candle eggs the beginner must train his eye to look for the points which have been enumerated and to note them quickly. Frequent checking of the candler's judgment by breaking out eggs, particularly those about which there is doubt, will prove very instructive and will be of great assistance to the beginner in acquiring confidence and skill.

N.B.—Figures and references omitted.

—" Marketing Eggs," *Farmers' Bulletin* No. 1378, *U.S.D.A.*

Groundnut in India

India is now the biggest producer of groundnut oil in the world although her share in the world trade is negligible, states the Agricultural Marketing Adviser to the Government of India in his Report on the marketing of Groundnuts in India and Burma. Her production of groundnut oil, during the five-year period 1933–34 to 1937–38, is estimated to have averaged 3,36,000 tons.

India ranks first in the acreage and production of groundnuts accounting for more than a third of the world's total, but her average yield per acre is only 900 lb., as compared with an average of 1,600 lb. per acre in China and over 2,200 lb. in Mauritius.

The cultivation of groundnuts in India has expanded rapidly during the last 40 years. From less than 300,000 acres in the beginning of the century, the area reached a record of over 9,000,000 acres in 1937–38, when production exceeded 3,600,000 tons of nuts.

Acreage and production during the quinquennium 1933–34 to 1937–38, however, averaged 7,000,000 acres and 2,800,000 tons respectively.

In 1938–39 and 1939–40 acreage and production showed a further increase and were well over 8,000,000 acreage and 3,000,000 tons, respectively.

The nuts grown in India are marketed under various trade names but fall into four main groups—Coromandel, Bold, Peanuts (Khandesh) and Red Natal.

Coromandel nuts account for nearly 56 per cent. of the total production while Peanuts (including Khandesh) and bold respectively contribute 22 per cent. and 18 per cent. of the total. The remaining 4 per cent. is shared between Red Natal and other non-descript and indigenous varieties.

Export Trade

India's chief customers for groundnut kernels before the war were France, the Netherlands, the United Kingdom, Germany and Italy, which together during the five years 1933–34 to 1937–38 provided a market for more than 87 per cent. of India's exports averaging 774,000 tons during this period. France ranked first with a share of more than 22 per cent. followed by the Netherlands and the United Kingdom with 20 per cent. and 17 per cent. respectively. Germany's share was about 16 per cent. and Italy's 12 per cent.

Although India ranks first in the export of groundnut kernels, her exports of groundnut oil are insignificant, the average exports during the quinquennium 1933–34 to 1937–38 being less than 4,000 tons to foreign countries and about 5,000

tons to Burma. The exports have, however, shown signs of a steady increase since 1935–36. The chief customers for oil are Burma, Ceylon, Mauritius, the Straits Settlements and the United Kingdom.

Exports of groundnut cake are of greater magnitude, the average for the same five-year period being 219,000 tons. The United Kingdom is easily India's biggest customer for groundnut cake, accounting for nearly three-fifths of the total exports. Before the war Germany, the Netherlands and Belgium were important buyers.

The net available supplies of groundnuts in shell for consumption and crushing in India amount to nearly 1,400,000 tons; that is, somewhat less than 1,000,000 tons of kernels. About 328,000 tons of oil and 285,000 tons of cake are avilable for consumption in India.

Increased Internal Consumption

Groundnuts developed in India primarily as an export commodity; before the War of 1914–18, the major portion of the production was exported. Internal consumption has, however, steadily increased in the last 20 years, and now more than three-fifths of the crop are utilised in India.

Seed for sowing absorbs nearly one-eighth of the total production and a little more than one-sixteenth is estimated to be consumed in the form of edible nuts. The crushing of kernels for the manufacture of groundnut oil and groundnut cake is estimated to account for more than two-fifths of production.

The habit of eating groundnuts appears to have spread to all parts of India; in Bombay, for instance, groundnuts form an important item of food on fast days. The annual *per capita* consumption of nuts is, however, less than one and a quarter pounds. This, in the opinion of the Agricultural Marketing Adviser, appears to be capable of considerable expansion. The *per capita* consumption in Buma is almost double that in India.

Apart from the demand for kernels for crushing there has been in recent years a growing export demand for kernels and nuts suitable for edible use. The interruption of supplies from China resulted in a rapid increase in India's trade since 1936 and India has an opportunity of permanently retaining this trade if she succeeds in establishing a trade reputation for handpicked selected nuts and kernels before normal conditions return. Samples of kernels preprared according to Agmark specifications for edible kernels have been favourably received in the United Kingdom.

Burma has no export trade in groundnuts. More than three-fourths of her production is utilised for oil extraction and about one-twelfth as edible nuts.

The London price of Coromandel kernels provides a fair index of world values of this commodity. Groundnut kernels sold for as much as £32 per ton in London at times during the War of 1914–18, and even £50 per ton towards the end of 1918. Since 1933–34, prices have not averaged over £15 per ton. In India, groundnut kernels sold for as much as Rs. 450 at Madras in August 1919 and for over Rs. 250 per ton in 1928–29, but the average price has not exceeded Rs. 163 per ton since 1933–34.

Need for Organisation

Criticisms levelled by the report against the existing arrangements for marketing deal with the various deductions in the markets; the lack of organised trade bodies

to safeguard the interests of the producers and sellers and to regulate markets; the lack of uniformity in the basis of contracts and methods of sampling; the multiplicity of trade names and the diversity of weights and measures.

The produce is subject to many different charges—commissions, deductions for charities, octroi, terminal tax and allowances for quality, impurities and moisture—which may add up to as much as 20 per cent. of the value of the goods in the case of nuts in shell. Regulated markets would appear to offer some relief in this direction, by eliminating exorbitant charges and malpractices, but their number and the volume of produce passing through them is so far relatively small.

The adoption of a standard contract with a mutual basis in respect of impurities, etc., appears to be an urgent step to improve both the trading conditions and the quality of groundnuts, the Report continues. Steps to this end have already been taken by the Central Marketing Staff and as a result of conferences with representatives of trade associations and mills, terms of a standard contract have been drawn up and ratified by a number of the leading trade bodies.

Improvement in Quality

Factors which count in judging the quality of kernels for export are the percentage of free fatty acids and the percentage of impurities. There has been an improvement in respect of both factors in recent years but there is need for persistent efforts to reduce the percentage of impurities and adopting measures to prevent the development of free fatty acids, the Report points out.

Vanaspati, in the production of which groundnut oil is largely used, is often styled as being responsible for the deplorable widespread adulteration of ghee and measures such as compulsory colourisation have been suggested which in effect would shut off this important outlet for groundnut oil. An examination of the position of the margarine industry in other countries leads to the conclusion that an uncontrolled production of Vanaspati and utterly inadequate administration of food adulteration laws have been responsible for a considerable portion of Vanaspati being used for adulteration purposes. Steps should therefore, be directed towards diverting Vanaspati to its proper place in the dietary of the country rather than directly or indirectly stopping its manufacture.

—*Indian Information*, Vol. 9, No. 83.

Industrial Uses of Sugarcane Bagasse

The importance of cellulose in the economic life of a nation may be gauged by the multiple uses of this material. It is one of the basic needs of a civilized country either in time of peace or in time of war. Necessities of modern times such as paper, rayon, board or plastics of various types, lacquer, paint and particular powerful explosives are a few of the many useful articles manufactured from cellulose. In recent years, the industrial utilization of cellulose and the consumption of cellulosic products has grown so immensely that the principal sources of pulp-wood is known to be shrinking steadily. This led to the investigation of fibrous materials other than wood and cotton linters in search for new sources of cellulose.

Among the many agricultural wastes tested for their cellulose making value sugarcane bagasse has been regarded to be of paramount importance. This could be expected because cellulose is the principal component of plant tissues which constitutes the main bulk of the sugarcane bagasse. It appears that bagasse which is invariably thrown away as waste, burned or used as fuel in local sugar industries, is a potential source of raw materials for the manufacture of valuable articles required in the daily necessities of the people.

Pulp and Paper-making

24 Per cent. of the cane consists of the woody fibre, otherwise known as bagasse. The ultimate fibre obtained from bagasse is relatively short but compares favourably, if not better, as paper-making material, with the so-called soda pulp in the United States obtained from wood such as poplar and other trees of the same species. Bagasse pulp has certain points of superiority over the soda pulp usually adopted for the manufacture of book and other printing papers. In strength, paper made from bagasse pulp occupies a position between the paper made solely of soda pulps and paper made of sulphite pulps, soda paper being the weakest and sulphite paper the strongest. Paper from bagasse pulp has been considered to be an excellent book paper provided it is properly loaded. Bond paper possessing excellent qualities of feel and finish but weak can be made also of sugarcane bagasse pulp. Since bagasse fibre is short and can only be made into a weak sheet by itself, it serves best in admixture with rag and sulphite for book paper making and the manufacture of low grade writing paper. Pulp from bagasse could hardly be considered in the production of wrapping paper in which strength is of primary consideration.

The manufacture of paper from bagasse of woody materials involves two distinct operations, that is, pulping and paper making. Pulp is the product obtained by treating the material so as to dissolve out or remove the impurities of the ultimate fibre (cellulose) in vegetable tissues leaving it in a relatively pure state. Bagasse can be converted into pulp by one of several processes such as soda, sulphate, nitric acid or the pomilio chlorination method. The technical merits and disadvantages of each of these processes depends largely on local conditions where the mill is located. The fact remains, however, that the paper industry generally employs the soda process in the conversion of specially short fibred materials into pulp. This seems to point that the soda process is best suited to pulp bagasse.

Experiments in pulping have demonstrated that bagasse can be successfully digested either by the soda or the sulphate process. The differences of these methods as to the yield and quality of the pulp obtained were found to be negligible, although the sulphate process has the advantage of being cheaper to operate on account of the low cost of chemicals needed. The slight advantage of this method is, nevertheless, offset by the offensive odour emanating from sulphate pulping which would undoubtedly be objectionable in or near inhabited places or cities.

It is believed that the reduction of bagasse into pulp can be carried out profitably under a home industry operation. In this scheme, enormous capital and elaborate cooking equipment which otherwise would be necessary in commercial scale production are not required. Since the industry is a home affair

and operated by the capable members of the family, the factory could be limited to a daily capacity of from 30 to 50 kilos or more depending on the number of persons in the family engaged in the work.

Rayon (Artificial Silk)

" Artificial silk " is the name first applied to a fine thread that resembles in lustre and general appearance the natural silk, obtained in transformation of cellulose. The term *artificial silk* is misleading for many would reasonably suppose that the substance is the same in composition and nature as the fibre derived from silk worms, but made by chemical or artificial means. At first, several terms such as " imitation silk " and " lustre cellulose " were suggested, but people engaged in the true silk industry were opposed to any name bearing the term silk or implying the word lustre because of the competition that their product received from the new imitation silk. This caused much confusion not only among the producers but also among the consumers. On account of this difficulty the National Retail Dry Goods Association in the United States formed a committee which adopted the trade name " rayon " for the silk-like fibre.

The idea of producing rayon is not by any means a modern one, for the historic background of the industry is laid in the archives of the different countries in Europe. About the middle of the 18th century Rene A. F. Reaumur, a French physicist and naturalist, and Dr. Robert Hooke, an eminent English scientist, were the first in Europe associated with the idea of a man-made silk. Although there were numerous articles relating to artificial silk in the years that followed, no development of any significance in the manufacture of artificial silk came about until 1840 when a Saxon, named F. G. Keller, of Hinichen, discovered the process of producing pulp wood. From a textile point of view, the fact remains that Count Hilaire de Chardonnet who invented the nitrocellulose process of making artificial silk in 1880, is regarded as the father of the rayon industry. Chardonnet died in 1924 after living long enough to see his ideas became reality and developed into a world-wide industry.

The principal raw material for the manufacture of all rayon, films, transparent paper, yarns and similar material is pure cellulose which can be obtained from bagasse and other fibrous materials.

Lacquer, Plastics and Fibre Boards

A brief discussion of the uses and the technology of lacquer, plastics and fibre boards may create a better appreciation of the importance of these materials. Plastics, lacquer and artificial board are made from various substances, namely, cellulose and chemicals of different types. Plastics with cellulose base are the transformation products of plant tissues chemically treated under proper conditions of temperature and pressure. In another case, plastics and artificial board are produced by making two or more chemical compounds react with each other, resulting in the formation of a product which is essentially different from the parent substances. It is believed that in the course of the reaction a tiny particle of one of the substances gets firmly tied or chained to the particle of the other ingredients in such a manner that these microscopic units are interlocked forming a relatively tough and hard material known as plastics. When cellulose is treated with proper chemicals such as acetic anhydride, nitric acid or sulphuric acid

under certain conditions that promotes plasticization, compound bearing horn-like properties is formed. This is called cellulose plastic.

It would be impossible to enumerate and describe the uses of cellulose plastics in an exposition of this nature because this wonder-child of science has already replaced numerous steel and wood articles which were extensively used in the furniture, automobile and radio industries. The inherent properties of cellulose plastics such as flexibility, rugged toughness, and resiliency make them useful as safety steering wheels for automobiles. Wood was first adopted for this purpose but it was found to have its shortcomings. In case of accidents wood splinters readily which naturally contributes to the injury of the drivers. Because of its flexible nature rubber bid for the task, but it did not last long in the industry. Once its coating is worn out, rubber gives off lamp-black which soils clothing that may happen to come in contact with it. Cellulose acetate plastics surmounted these objections. To the steering wheel it lends strength and resilience and yields only under severe stress. The wheel finish is assured permanence for the colour is an incorporated part, affording whatever colour shade is desired with any depth of tone preferred.

Automobile manufacturers are employing cellulose plastic for their instrument panels which include clocks, speedometers and radio switches. Moulded panels of the cellulose acetate type are also inserted in escutcheon plates to match-upholstery. In addition to these uses, plastics of cellulose origin find uses as gear shift knobs, door handles, window lifts, ash trays, hand throttles, cigarette lighters and lighting switches. Latest reports indicate that one of the most prominent automobile manufacturers is preparing to make entire automobile bodies out of plastics. Toys of various kinds are principally made of cellulose nitrate.

Wall-board, insulating board and masonite are well known articles made from sugarcane bagasse either in admixture with other fibrous materials or alone. A new type of plastic compound which is claimed to be inexpensive has been recently prepared from bagasse lignin and cellulose. When bagasse is properly hydrolyzed by hydrochloric acid alone or in the presence of aniline, or treated with sodium hydroxide and furfural, the ligno-cellulose components of bagasse are converted into moulding compositions suitable for the manufacture of plastic boards which exhibit strength and resistance to water depending on the process used in their preparation. These plastics in their stage of develpoment would probably be suitable for bath-room tiles. Those which are less resistant to moisture but strong and show no warping properties would appear to have much greater value for structural purposes, such as in the construction of desk tops and building panels.

Any review of the important uses of bagasse in the plastic industry would be incomplete without mentioning the plastic boards from sugarcane waste prepared by the wall-board laboratory of the Bureau of Science. In appearance as well as hardness these boards resemble masonite that is now sold in the local market. As the investigation on sugarcane by-products progress it is difficult to predict what the future has in store for further uses of bagasse.

Knowledge in the nitration of cellulose has contributed to the tremendous advance of the lacquer industry. Its development in the last 25 years has been phenomenal. Automobile bodies, furniture, house partitions, window panels

and other furnishings owe their beauty mainly to their coats of nitro-cellulose lacquer. The rapid expansion of the lacquer industry may be illustrated in the automobile factory. In 1923 less than one per cent. of the automobiles made were finished with lacquer. Four years later (1927) over 95 per cent. of the automobiles manufactured in the United States were lacquer-finished. This rapid change was made possible partly by the progress attained in the cellulose industry and partly by laboratory research and tests which had proven the durability and adaptability of the new finish to any kind of surface. From the automobile and furniture industries, it was only a short step to the railroad industry so that to-day many of the railroad carriages are finished with lacquer. Durability, clarity of colour and the reduced time of application are a few of the many advantages of nitro-cellulose lacquer over the oleo-resinous advantages of nitro-cellulose lacquer over the oleo-resinous finishes. The reduced time of its application makes it possible to completely refinish a room in twelve hours, thus avoiding unnecessary losses in rental in the case of hotel rooms or offices.

—"*Sugar News*," extracted from *The South African Sugar Journal*, Vol. 25, No. 7.

List of Publications with Important Contents received at the Mysore Agricultural and Experimental Union

June–December 1941

(*For Members' Reference*)

Bulletin of the Pan-American Union,

June 1941—

Pan-American Co-operation in Agriculture. *José L. Colom* .. (25)

Brazilian Agricultural Resettlement Programme .. .. (25)

July 1941—

The Venezuelan Institute for Veterinary Research .. (23, 30)

Inter-American Coffee Board .. .. .. (24, 25)

Coffee Export Regulations in Nicargua .. .. (24, 25)

August 1941—

The Inter-American Statistical Institute .. .. .. (25)

October 1941—

Agriculture in the Sao Paulo-Northern Parana Region .. .. (25)
Irwin P. Keeler and Richard F. Lankenau

The 4-H Club Movement in Cuba and Venezuela .. .. (25)

O Biologico, March 1941 .. .. (23)

Review of Applied Entomology, June, July, August Series, A & B .. (16)

Lingnan Science Journal, Vol. 20, No. 1, May 1941—

Catalogue of Aquatic Hemiptera of China, Indo-China, Formosa and Korea. *William E. Hoffmann* .. .. .. (16)

Bulletin of the Imperial Institute, London,

Vol. 39, No. 1, Jan.-March 1941—

War-time Drug Supplies and Empire Production—Part I. *M. Ashby* (57)

Insect Infestation of Cacoa Beans in the Producing Countries. *J. M. Nicol* .. .. (53)

The Manufacture of Dried Banana Products .. .. (39)

Vol. 39, No. 2, April-June 1941—

Hyptis Seed from Nigeria and the Sudan .. .. .. (57)

Insense Gums from British Somaliland .. .. .. (44)

Pinus halepensis Oleo-resin from Cyprus—II .. .. (44)

War-time Drug Supplies and Empire Production—Part II. *M. Ashby* (57)

Medicinal Herbs in War-time .. .. .. (39, 57)

Vol. 39, No. 3, July-September 1941—

Two New Ocimum Oils from Africa .. .. (39, 57)

Dyeing and Tanning Plants in East Africa. *P. J. Greenway* .. (57)

The Cultivation of the Soya Bean in the United Kingdom .. (48)

Investigations of Insecticidal Plants in Puerto Rico .. .. (17)

The Storage of Nuts .. .. (39)

The Philippine Agriculturist,

Vol. 30, No. 2, July 1941—

Notes on Education and Livestock Industry of New Zealand. *F. M. Fronda* .. .. (23, 25)

A Comparative Study of Nutrients of Nuts of Pili (*Conarium ovatum* Engler). *Glicerio M. Garcia* .. .. (39)

The Effects of Fertilizing both the Seed-bed and the Field upon the Yield of Elon-elon Rice. *Celso C. Songeuya* .. .. (46)

Edible and Inedible Portions in the Different Wholesale Cuts of Wethers and Wethergoats at one and a half Years of Age. *Abelardo Mabbayad Gatan* .. .. (36)

Addition of Potassium Sulphate and Superphosphate with Ammonium Sulphate to Lipa Clay Loam for Upland Rice. *Tomas G. Cabotage* .. .. (46)

An Aspergillus Liquefying Glycerine Jelly. *Isidro S. Macaspae* .. (15)

A Comparative Study of Laying Ducks Raised in Battery Laying Cages and in the Pen. *Cesario E. Alviar* .. .. .. (32)

Vol. 30, No. 3, August 1941—

Agricultural Education in Australia. *F. M. Fronda* .. .. (23)

Introduction and Trial Culture of Java Nepheliums in the College of Agriculture. *N. B. Mendiola* .. .. .. (39)

Comparative Mineral Constituents (Iron, Calcium and Phosphorus of Elon-elon Rice grown in different parts of the Philippines. *Hipolito A. Custodia* .. .. (46)

A Study of Root-nodule Bacteria of Certain Leguminous Plants. *Saturmino A. Posadas* .. .. (48)

Labor Requirement and Cost of Growing Corn with Machinery and Native Implements. *Alejandro B. Catambay and Higino R. Marquez* .. .. (42)

Vol. 30, No. 4, September 1941—

Some Aspects of the Salt requirements of Rice Plants during Vegetative State. *Hsieh Feng Yuan* .. .. .. (46)

Determination of Furfural from some Farm By-products. *Silverio M. Fontillas* .. .. .. (13, 14)

An Economic and Social Survey of Sugarcane Tenancies on the Calamba Sugar Estate, Laguna. *José E. Velmonte and Alfonso B. Castro* .. .. (23)

Vol. 30, No. 5, October 1941—

The Possibility of Commercial Production of Butyric Acid from Raw Sugar and Waste Molasses. *L. J. Villanueva and Irinco M. Olalia* .. .. (49)

Experimental Transmission of the Mosaic of *Canna indica*. *G. O. Oefemia, Isidro S. Macaspac and Hsieh Feng Yuan* .. (39)

Hematological Studies on Cattle: IV. Variations of Homoglobin and White Blood Cells in the Philippine Native Breed of Cattle. *Miguel Manresa and Sixto C. Orig* .. .. .. (30)

Absorption of Soil Potassium by Rice. *N. L. Galvez and Pericles S. Subido* .. .. (46)
Studies on the Fertilizing Value of Mayon Volcano Ash: IV. Effects upon Growth and Development of Abaca Plants. *Vicente C. Ureta* .. .. (11)
Comparative Effects of Four Commercial Fertilizers upon the Yield of Native Yellow Flint Corn. *Fransisco Barros* .. (42, 45)
Broomcorn Seeds as a Grain Feed for Layers. *F. M. Fronda, L. P. Zioleita and E. Basio* .. .. (32)
Vol. 30, No. 6, November 1941—
Behaviour of Some Hidden Variations. *N. B. Mandiola* .. (10)
A Five-year Farm Accounting Study of Tenancies in the College of Agriculture Farm, 1931–36. *M. V. Arnaldo and J. E. Velmonte* (26)
Further Studies on Molasses as Hog Feed: Molasses *Versus* Rice Bran in Rations for Growing and Fattening Pigs. *Emmanuel T. Gervacio* .. .. (35)
Studies of the Fertilizing Value of Mayon Volcano Ash: V .. (11)
Effects upon the Growth and Yield of Soy Bean. *Pang Kwock Kee* (48)

The Journal of the Department of Agriculture, Victoria, Australia,
Vol. 39, Part 5, May 1941—
Daily Distribution of Milk Essential .. .. .. (29)
Prevention of Tetanus .. .. (30)
Some Diseases of Cabbages and Cauliflowers. *L. L. Stubbs* .. (39)
The Pre-harvest "Drops" of Fruit-Reduction by Spraying. *C. E. Cole* (39)
Actinomycosis—"Lumpy Jaw" or "Woody Tongue". *S. A. Mountjoy* (30)
Neutralization of Sour Cream for Buttermaking: II. The Titratable Acidity of Cream and Buttermilk and the pH of Butter. *W. J. Wiley* .. .. (29)
How to Keep Winter Milk Production Always at Summer Level .. (29)
Do You Keep Pigs? .. .. (35)
Warm Drench for Horses .. .. (31)
Vol. 39, Part 6, June 1941—
War-time Agriculture in Victoria. *H. A. Mullett* .. .. (25)
Potato Seed Certification .. .. (47)
Flax and the War .. .. (51)
Pasture Plants of Victoria. *W. D. Andrew* .. .. (40)
Lice on Poultry .. .. (32)
Blowfly Strike in Sheep .. .. (33)
Phosphatic Licks for Sheep are of no value in Australia .. (33)
The Separator Float .. .. .. (20, 29)
The Value of Agricultural Show .. .. .. (23)
Separated Milk as a Pig Food .. .. (35)
Potato Grading .. .. (47)
The "Sectional Contamination" Defect in Butter. *T. M. Jensen* .. (29)
Factors Affecting Yield of Apples .. .. .. (39)
Preserving of Apples .. .. (39)
To Combat Vine Diseases .. .. (39)

Vol. 39, Part 7, July 1941—
Australian Brown Onion Seed for Britain .. .. .. (39)
Budding, Grafting and Methods of Re-working Fruit Trees. *J. L. Provan* .. .. (39)
Milking Cows on Pasture-Meat Meal as a Supplementary Source of Protein. *A. C. T. Hewitt* .. .. (30)
Certified Potato Seed .. .. (47)
Ammonia and Nitrate—Supplying Our Soils with Nitrogen .. (11)
Payment for Quality—Problems of Fat Lamb Production. *W. B. Miller* .. .. (29, 33)
Brucellosis of Swine. *C. Pope* .. .. (36)
Vol. 39, Part 8, August 1941—
Phenothiazine Treatment Against Worms—Valuable New Drug .. (30)
Meat Export Trade. *A. C. Fisken* .. .. .. (29)
Construction of Dairy Buildings. *A. F. Bottomley* .. .. (20)
Budding, Grafting and Methods of Re-working Fruit Trees. *J. L. Provan* .. .. (39)
The Value of Pastures. *A. C. T. Hewitt* .. .. .. (40)
Poultry Feeding Tests, 1939–40. *W. O. Pederick* .. .. (32)
The Selection and Maintenance of Starter Cultures for Cheese-Making I.—Function of Starter in Cheese-making and Types of Starter Available. *T. M. Jensen* .. .. (29)
Protection of Large Wounds in Fruit Trees .. .. (39)
Nutrition of the Tobacco Plant—Relation to Soil Conditions. *F. Penman* .. .. (56)
Vol. 39, Part 9, September 1941—
Feeding Cereals to Pigs—Importance of Protein Supplements. *J. A. Morrow* .. .. (35)
Blossom Killing Sprays for Apple Crop Restriction. *Frank M. Read* .. .. (39)
Budding, Grafting and Methods of Re-working Fruit Trees. *J. L. Provan* .. .. (39)
Selection of Specimen Material for Identification of a Plant Disease (15)
Paspalum Ergotism in Cattle. *A. R. Grayson* .. .. (30)

The Implement and Machinery Review,
Vol. 67, No. 793, May 1941—
The New Task for Agricultural Engineers .. .. .. (25)
Lessons of War-time Food Production .. .. .. (25)
Material for Dairy Equipment .. .. (27)
The New Tempo of the Ensilage Campaign .. .. .. (28)
An Agricultural Engineering Opportunity in the New Silage Campaign .. .. (28)
The "New Technique of Farm Grinding" .. .. .. (20)
Potato Planting Simplified .. .. (47)
Usefulness of the Disc Harrow .. .. (20)

Vol. 67, No. 794, June 1, 1941—
A Critical Examination of War-time Farm Mechanisation (25, 20)
The Tractor Industry .. .. .. (25, 20)
More About the " New Technique of Farm Grinding" .. .. (20)
Vol. 67, No. 795, July 1, 1941—
One Hundred Thousand Tractors! .. .. (25, 20)
Self-Sufficiency in Food Production? .. .. .. (25)
The Care of Pneumatic Tyres on Farm Vehicles .. .. (20)

The South African Sugar Journal, Durban,
Vol. 25, No. 5, May 1941—
Off Season Corrosion in Sugar Factories. *C. W. Waddell* .. (49)
A Mill *versus* A Shredder. *D. W. W. Heidry* .. .. (49)
Vol. 25, No. 6, June 1941—
Insects and Sugarcane. *J. Dick* .. .. .. (49)
Some Observations on Bagasse Boiling. *J. V. Kirkwood* .. (49)
Pre-harvest Burning of Sugarcane. *Arthur H. Rosenfeld* .. (49)
Valuation of Fertilizers—Unit Values for 1941. *A. J. Taylor* .. (11)
World Consumption of Sugar .. .. (49)
Sugar Crops of the World .. .. .. (49, 50)
A Problem in Tea Cultivation .. .. (53)
Vol. 25, No. 7, July 1941—
Industrial Uses of Sugarcane Bagasse. *Mariano P. Ramiro* .. (49)
Silage from Sugarcane Tops. *P. J. Skerman* .. .. .. (49, 28)
Vol. 25, No. 8, August 1941—
The United States and World Sugar Situation. *Ody H. Lamborn* .. (49)
Release of Cane Variety Co. 331 .. .. .. (49)
Land and Food—Alternative Crops in the Sugar Belt .. (6, 49)
Vol. 25, No. 9, September 1941—
The Protection of Sugarcane from Pests and Diseases .. (49)
Notes on Milling and Milling Practice. *W. S. Birkett* .. .. (49)
Control of Malaria in Sugar Belt .. .. (22, 49)
Sugar Refining in 1596 .. .. (49)
Vol. 25, No. 10, October 1941—
Industry and the Land .. .. (25)
Soil Erosion and the Cane Grower. *Dr. H. W. Kerr* .. .. (49)
Power Alcohol from Sugar .. .. (49)
Some Notes on Continuous Clarifiers. *Colin W. Waddell* .. (49)
Sugarcane Varieties in Mauritius .. .. .. (49)
Education, Experience and Engineers—Theory and Practice. *W. L. Badger* .. .. (25)

The Journal of the Jamaica Agricultural Society,
Vol. 45, No. 4, April 1941—
Buying a Boar .. .. (35)
Yams .. .. (47)
Corn—Planting Distances .. .. (42)
Citrus Pests Investigation. *R. G. Fennah* .. .. .. (39)
Analysis of Seymour Grass .. .. (40)

The Sunflower (*Helianthus annus*) .. .. .. (40)
Bud Rot Diseases of Coconuts .. .. (55)
Erosion Control Plot .. .. (4)
The Spacing of Maize on Jamaica "Red Dirt" . *R. F. Innes* .. (42)
Wholesome Milk .. .. (29)
Vol. 45, No. 5, May 1941—
Cure for Cow's Bad Eye .. .. (30)
Spraying. *John F. Carter* .. .. (15)
Poultry-Rearing. *D. Norman* .. .. (32)
The Issue of Spraying Equipment and the Formation of Groups .. (15)
The Control of Slugs and Snails .. .. .. (19)
Roselle (*Hibiscus sabdariffa*) .. .. (39)
Vol. 45, Nos. 6 and 7, June–July 1941—
Mixed Farming .. .. (6)
Keep the Top Soil on the Land .. .. (4)
On the Meaning of "Significant Difference". *R. F. Innes* .. (1)
The Soybean (*Glycine max*). *C. D. Hutchings* .. .. (48)
My Father was a Soil Builder. *Angus McDonald* .. .. (4)
Soft-shelled Eggs .. .. (32)
Scab Disease of Grape Fruit .. .. (39)
"Grass that Fights Snakes" .. .. (40)
Date Palms .. .. (55)
Sickness in Pigs .. .. (35)
Bronchitis in Fowls .. .. (32)
Marketing. *E. G. Whitbread* .. .. (24)
Chickens Weak in the Leg .. .. (32)

The New Zealand Journal of Agriculture,
Vol. 62, No. 4, April 1941—
Deleterious Wool Branding Fluids .. .. (13, 33)
The Fruit Crops .. .. (39)
The Honey Crops .. .. (34)
Stumping with Tractors .. .. (20)
Watch Quality in Your Dairy Produce. *C. Walker* .. .. (29)
The Wild Pig Menace. *G. R. Mackintosh* .. .. .. (19)
How Your Milking Machine Works—The Vacuum Gauge. *W. G. Whittleston* .. .. (20, 29)
Make the Most of Stock Nitrogen .. .. .. (11)
Save Your Own Tomato Seed. *D. K. Pritchard* .. .. (39)
Prevent the Spread of Abortion Disease .. .. .. (30)
Feeding Oats to Lambs and Sheep in the South Island .. .. (33)
Psoralea pinnata is an Aggressive Weed .. .. .. (8)
Striated Clover. *N. Lamont* .. .. (40)
Destruction of Ratstail in Pastures. *P. S. Syme* .. .. (40)
Orchard is Essential for Successful Distribution. *J. H. Throp* .. (39)
Preparations for New Plantings. *L. Paynter* .. .. (6)
The Control of Citrus Diseases in the Orchard. *A. W. M. Greig* .. (39)

Stacking of Fruit in Cool Storage. *A. Powell* .. .. (39)
Points in Making Cider. *B. W. Lindeman* .. .. .. (39)
Growing Spring Cabbage for Spring Cutting. *D. K. Pritchard* .. (39)
Production of Bees Wax .. .. (34)
Beware of Dirty Crates in Marketing Live Poultry. *F. C. Bobby* .. (32)
Management for Egg-production .. .. .. (32)
Pre-school Child—Our Duty is to Protect Its Health .. .. (22)
Vol. 62, No. 5, May 1941—
Should Sheep be Run on the Dairy Farm? *G. A. Blake* (27, 33)
Changes in Fertiliser Programme .. .. .. (11)
The Poultry Industry .. .. (32)
Linen Flax is a Payable Crop in Marlborough. *D. R. Wilkie* .. (51)
Trees for Shade, Shelter and Timber. *A. M. Lee* .. .. (44)
Pig Feeding Trial with "Mother Liquor" from Whey. *C. V. Dayus* .. .. (35)
Pasture Establishment on Pumice. *C. S. Dolgliesh* .. .. (40)
Maize and Kumi Kumis. *A. V. Allo* .. .. .. (42)
Pasture Improvement by Crop Rotation. *A. D. Mercer* .. (40)
Fertilizer Mixtures for Rape. *I. L. Elliott* .. .. .. (52)
Curd Feeding to Poultry. *E. R. Marryatt* .. .. .. (32)
Shell Line Deposits. *C. Walker* .. .. .. (11)
Coughing in Animals (Horses) .. .. (31)
Results of Long-term Plan to Eliminate Contagious Abortion from a Herd .. .. (30)
Live Fencing Posts. *W. T. Brown* .. .. .. (20)
Making a Drill and Harrow Combine .. .. .. (20)
Strawberry Clover for Wet or Saline Soils .. .. .. (11)
New Conditions for Supplying Milk or Cream. *A. E. Morrison* .. (29)
Citrus Bud Selection. *A. M. W. Greig* .. .. .. (39)
Stock-taking of Limes in Storage. *A. Powell* .. .. (39)
Potatoes for Early Planting. *D. K. Pritchard* .. .. (47)
"Bad Eggs". *F. C. Bobby* .. .. (32)
Production of Green Food. *E. C. Jarrett* .. .. .. (30)
Vol. 62, No. 6, June 1941—
Bearing Trouble in Ewes. *A. D. M. G. Laing* .. .. (33)
Ploughing—Methods of Measuring Out the Land, Striking Out and Finishing. *J. G. McKay* .. .. .. (2, 20)
How to Apply Ground Limestone to Pastures. *A. G. Elliott* .. (11)
Novel Use of Stream Water for Power, Shed Cleaning and Cream Cooling. *D. M. E. Merry* .. .. .. (27, 29)
Coughing in Animals (Cattle) .. .. (30)
Construction of Liquid Manure Distributor. *C. R. Taylor* .. (20)
Prune Your Trees with Intelligence. *L. Paynter* .. .. (39)
Grading and Packing Citrus Fruits .. .. .. (39)
Survey of Bee-keeping Industry .. .. (34)
Artificial Lighting and Winter Egg-production. F. C. Bobby .. (32)
Care of Breeding Stock. *H. A. Kitto* .. .. .. (30)
Inspection of Apples and Pears. *A. Powell* .. .. (39)

Vol. 63, No. 1, July 1941—
Herd Improvement Plan .. .. (30)
Linen Flax and the Farmer .. .. (51)
Noxious Weed Control .. .. (8)
Emergency Cool Storage .. .. (20)
Wheat Under Irrigation. *A. G. Elliott* .. .. .. (43)
Horses Sound and Unsound. *J. Mullins* .. .. .. (31)
Making Most Efficient Use of Phosphatic Fertilisers. *I. L. Elliott* .. (11)
No Quota on Farmyard Manure. *G. A. Blake* .. (25, 11)
Reduce Cress Taint in Cream. *A. V. Allo and F. H. McDowell* .. (29)
Pampas Grass. *C. R. Taylor* .. .. (40)
Coughing in Animals (Sheep) .. .. (33)
A Home-made Stock Lick Box. *C. Walker* .. .. .. (30)
Feeding Hay to Sheep by Bag and Wire Trough. *G. G. Calder* .. (33)
Spraying to Control Insect Pests. *L. Paynter* .. .. .. (17)
Planting Trees and Shelter Belts. *A. M. W. Greig* .. .. (44)
Asparagus in the Home Garden .. .. .. (39)
Raising Tomato Plants .. .. (39)
Moving Bees to New Sites. *T. S. Winter* .. .. .. (34)
Making a Success of Incubation. *W. L. Jourdain* .. .. (32)
Clean Food in Clean Homes .. .. (22)
Vol. 63, No. 3, September 1941—
Serpentine Superphosphate. *A. G. Elliott* .. .. .. (11)
Vaccination Against Pulpy Kidney in Lambs .. .. (33)
Phenothiazine—A New Drug for the Control of Internal Parasites. *L. K. Whitten* .. .. (30)
Pig Feeding Trials on Copra and Whey. *M. S. Scott* .. .. (35)
The Link between the Farmer and the Merchant. *S. H. Saxby* .. (24)
Bull Fertility Testing Service. *T. A. Blake* .. .. (30)
Renovating Farm Pastures. *P. S. Syme* .. .. .. (40)
Treatments for the Control of Smuts in Cereal Crops. *D. M. E. Merry* .. .. (45)
Prevention of Black-leg in Calves. *By the Livestock Division* .. (30)
Value of Certificate of Record Testing. *H. J. Kaye* .. .. (30)
Lamb Losses at Marketing Time .. .. .. (33)
Paralysis in the Cow After Calving .. .. .. (30)
Rearing Motherless Lambs. *R. P. Hill* .. .. .. (33)
Another Method of Repairing Worn-out Tanks. *P. S. Syme* .. (20)
Manuring of Maize. *J. E. Bell* .. .. (42)
Novel Method of Stacking Hay. *G. K. McPherson* .. .. (40)
Classification of Oranges. *A. M. W. Greig* .. .. .. (39)
Beans—A Valuable Garden Crop. *D. K. Pritchard* .. .. (48)
Setting Out Tomato Plants .. .. (39)
Increasing the Number of Hives. *T. S. Winter* .. .. (34)
Avoid Heavy Losses in Chick-Rearing. *F. C. Bobby* .. .. (32)
Management and Feeding of Chickens during the Brooder Stage. *L. Cocker* .. .. (32)

Vol. 63, No. 4, October 1941—

Electric Power from Small Streams. *D. M. E. Merry* .. .. (20)
Cobalt Deficiency in Sheep. *J. F. Filmer* .. .. .. (33)
What To Do in the First-Aid Treatment of Wounds in Horses. *A. G. Brash* .. .. (31)
Timely Cultivation is the Foundation of the Crop. *W. C. Stafford* .. (6)
What Crops can I Grow for the Pigs. *D. M. E. Merry* .. .. (35)
Choosing Land for a Market Garden. *D. K. Pritchard* .. .. (39)
Treatment of Bloat in Cattle. *By the Livestock Division* .. (30)
Actinobacillosis in a Bull. *R. P. Gilder* .. .. .. (30)
Plot suspected as Poisonous to Stock. *H. H. Bayley* .. .. (30)
Automatic Device to Ensure Permanently Open Mole Drain Outlets. *N. Lamont* .. .. (5)
New Tools for Old .. .. (20)
Spraying of Apples and Stone Fruits. *G. Stratford* .. .. (39)
Using Bordeaux Mixture .. .. (15)
Green Crops for the Winter. *D. K. Pritchard* .. .. (27)
Rising Queen Cells. *T. S. Winter* .. .. .. (34)
Care of Tomato Plants. *D. K. Pritchard* .. .. .. (39)
Coccidiosis of Fowls .. .. (32)

Estacion Experimental Agricola, Rio Pedras, Puerto Rico,

Bulletin No. 58, Junio 1941—

El Costo del Maintenimiento de Animales su Relacion con Eluso de la Tierra en la Costa Noroeste y la zona Taba Calera. Fransisco de Jesus .. ..

Bulletin No. 57, Marzo, D. 41—

Consumo De Alimentos en la Zona Rural de Puerto Rico. *S. Diaz Pacheco* .. ..

Bulletin No. 60, Junio 1941—

Precio del Tabaco en Rama al Agricultor en Puerto Rico del 1907 Al 1940. *Jorge J. Serrales, Jr., y Martin Velez, Jr.* .. ..

Agricultural Experiment Station, Puerto Rico,

Research Bulletin No. 1, April 1941—

Chemical Data of Puerto Rico Soils. *J. A. Bonnet* .. .. (11)

Research Bulletin No. 2, May 1941—

The Life-history of *Œsophagostomum radiatum*, the Common Nodular Worm of Cattle. *John S. Andrews and Jose F. Moldonado* (30)

Research Bulletin No. 3, May 1941—

A Physiological Study on the Effects of Waxing Pineapples of Different Stages of Maturity. *N. A. Schappelle* .. .. (39)

Bulletin No. 59, June 1941—

Food Consumption Studies in Puerto Rico. *S. L. Descartes, S. Diaz Pacheco and J. R. Naguera* .. .. (22)

University of Puerto Rico, Agricultural Experiment Station Annual Report, 1939–40. *J. A. B. Nolla* (Director) .. .. .. (1)

Virginia Truck Experiment Station, Norfolk, Virginia,

Bulletin No. 106, January 1941—

Rapid Soil Tests for Determining the Fertiliser Requirements of Vegetable Crops in Eastern Virginia. *E. R. Purvis and J. M. Blume* .. .. (39)

Ohio Agricultural Experiment Station, Wooster, Ohio,

Bulletin No. 618, January 1941—

Bloom Period and Yield of Apples. *C. D. Ellenwood* .. .. (39)

Bulletin No. 619, March 1941—

Control of Lawn Weeds and Renovation of Lawns. *F. A. Welton and J. C. Carrol* .. .. (8, 39)

Bulletin No. 616, December 1940—

Growing Ornamental Greenhouse Crops in Gravel Culture. *Alex Laurie and D. C. Kiplinger* .. .. .. (39)

Bulletin No. 612, March 1940—

Ohio Agricultural Statistics, 1938. *Glen S. Ray, Oakley M. Frost and P. P. Wallrabenstein* .. .. .. (1, 2)

Bulletin No. 614, August 1940—

The Ohio Farmer and His Milk Market. *C. G. McBride* .. (29)

Bulletin No. 613, August 1940—

Lawn Experiments. *F. A. Welton and J. C. Caroll* .. .. (39)

Bulletin No. 615, August 1940—

Ohio Potato Diseases. *Paul E. Tilford* .. .. .. (47)

Bulletin No. 621, May 1941—

Ohio Agricultural Statistics, 1939. *Glen S. Ray, Oakley M. Frost and P. P. Wallrabenstein* .. .. (1)

Bulletin No. 620, May, 1940—

Fertilisation of Ornamental Trees, Shrubs and Evergreens. *L. S. Chadwick* .. .. (39)

Cornell University Agricultural Experiment Station, Ithaca, New York,

Bulletin No. 743, November 1940—

Instalment Credit in the Sale of Washing Machines. *Mabel A. Rollins* .. .. (21, 20)

Bulletin No. 747, January 1940—

Some Facts Concerning Costs of Operation of Farm Motor Trucks. *M. P. Rasmussen and P. M. Williamson* .. .. .. (20)

Bulletin No. 751, April 1941—

Cost of Farm Power and Equipment. *J. P. Hertel and Paul Williamson* .. .. (20, 26)

Memoir 233, December 1940—

Germination of the Conidea of *Sclerotina fructicola* with Special Reference to the Toxicity of Copper. *Ch'wan-Kwang Lin* .. (15)

Memoir 232, June 1940—

A Catalogue of the Plecoptera of the World. *Peter Walter Classen* (16)

Bulletin No. 766, July 1941—

Controlling the Pre-harvest Drop of Apples. *M. B. Hoffman* .. (39)

Bulletin No. 762, June 1941—
Controlled Atmosphere Storage of Apples. *R. M. Smock and A. Van Doren* .. .. (39)
Bulletin No. 756, May 1941—
Costs and Returns from Farm Enterprises. *Paul S. Williamson* .. (26)
Bulletin No. 754, April 1941—
A Comparative Study of High-Temperature, Short-time and Holder Pasteurisation. *A. M. Millenky and H. J. Bruickner* .. (29)
Bulletin No. 751, April 1941—
Costs of Farm Power and Equipment. *J. P. Hertel and Paul Williamson* .. .. (20, 26)
Bulletin No. 752, April 1941—
Studies in the Control of Internal Breakdown of Table Beets by the Use of Boron. *C. J. Raleigh, O. A. Lorenz and C. B. Sayre* .. (47)
Bulletin No. 748, March 1941—
Fertilizers and Field Crops—I. *E. L. Worthen* .. .. (11)
Bulletin No. 749, March 1941—
Fertilizers and Field Crops—II. *E. L. Worthen* .. .. (11)
Bulletin No. 750, March 1941—
Fertilizers and Field Crops—III. *E. L. Worthen* .. .. (11)
Memoir 237, May 1941—
Reproduction of the Field Mouse *Microtus pennsylvanicus* (Ord.). *W. J. Hamilton Jr.* .. .. (19)
Memoir 235, May 1941—
A Study of Dormancy in Seeds of Polygonum. *Oren L. Justice* .. (39)
Memoir 234, April 1941—
Studies on Bitter Pit of the Apple. *R. M. Smock* .. .. (39)

Oklahoma Agricultural Experiment Station, Stillwater—
Current Farm Economics Series 49, April 1941, Vol. 14, No. 2 .. (25)

Georgia Experiment Station,
Bulletin No. 215, June 1941—
The Home Vegetable Garden. *H. L. Cochran* .. .. (39)
Bulletin No. 214, June 1941—
The Effect of Fertiliser and Lime on the Yield of Corn. *L. C. Olson and R. P. Bledsoe* .. .. .. (42)
Bulletin No. 213, June 1941—
I. Peanut Breeding and Characteristics of Some New Strains; II. Thiamin Chloride and Nicotine Acid Content of Peanuts and Peanut Products; III. Peptization of Peanut Proteins. *B. B. Higgins, K. T. Holley, T. A. Pickett and C. D. Wheeler* .. (52)
Bulletin No. 212, June 1941—
Foods Suitable for Freezing Preservation . . . Freezing Locker Plants. *J. G. Woodrof* .. .. (14)
Bulletin No. 211, May 1941—
Beef Cattle Feeding Institutions. *J. A. Massey* .. .. (30)

Bulletin No. 217, June 1941—
Further Studies with the Musedine Grape. *E. F. Savage* et al. .. (39)

U.S.D.A. Leaflets,
No. 86— Protect Hardwood Stands from Grazing (40, 44)

U.S.D.A. Circulars,
No. 600, May 1941—
Mortality of the Apple Maggot in Fruit Held in Cold Storage. *P. J. Chapman and A. D. Hess* .. .. .. (39)
No. 582, May 1941—
Avocado Diseases in Florida. *H. E. Stevens and R. B. Piper* .. (39)
No. 610, September 1941—
Adsorption of Mercuric Chloride from Solution by Gladiolus Corms. *R. H. Nelson and C. E. Cassil* .. .. .. (39)
No. 605, June 1941—
The Internal Application of Chemicals to Kill Elm Trees and Prevent Barkbeetle Attack. *R. R. Whitten* .. .. .. (44)
No. 601, April 1941—
Reducing Power Waste in Operating Cotton Gins. *Victor L. Stedronsky and Arvid J. Johnson* .. .. .. (41)
No. 609, May 1941—
Indoor Composting for Mushroom Culture. *Edmund B. Lambert* .. (39)
No. 602, May 1941—
Field Infestation by Insects and that Injure Rice in Storage. *W. A. Douglas* .. .. (46)
No. 607, July 1941—
The Black Grain Stem Sawfly and the European Wheat Stem Sawfly in the United States. *E. J. Udine* .. .. (43)
No. 270, June 1941—
Orchard Insects of the Pacific North and Their Control. *E. J. Newcomer* .. .. (39)
No. 604, August 1941—
Trading in Wool-top Futures .. .. .. (33, 24)
No. 617, September 1941—
Tests of Species and Varieties of Vetch for Resistance to the Vetch Bruchid. *J. S. Pinckney and R. E. Stitt* .. .. .. (48)
No. 99, June 1941—
Equipment of City Milk Plants. *C. E. Clement, J. B. Bain and F. M. Grant* .. .. (29)
No. 611, June 1941—
The Pan-America Tomato, A New Red Variety Resistant to Fusarium Wilt. *William S. Porte* .. .. (39)
No. 608, August 1941—
Surface Condition of Soil and Time of Application as Related to Intake of Water. *F. L. Duley and L. L. Kelly* .. .. (11)

U.S.D.A. Farmer's Bulletins—
No. 1870. Pruning Hardy Plants .. .. .. (39)

No. 1877. Buying Boys' Suits .. .. .. (21)
No. 1875. Mushroom Growing in the United States .. .. (39)
No. 1879. Ponds for Wild Life .. .. .. (37)
No. 1880. Control of Insect Pests of Grain in Elevator Storage .. (45)
No. 1070. The Fowl Tick and How Premises may be Freed from It (32)
No. 1508. Poultry Keeping .. .. (32)
No. 1422. Udder Diseases of Dairy Cows .. .. (30)
No. 1841. The Feeding of Chickens .. .. .. (32)
No. 1514. Control of Sugar Beet Nematode by Crop Rotation .. (50)
No. 1556. The Sorghum Midge with Suggestions for Control .. (54)
No. 1860. Gladiolus Diseases and Insects .. .. .. (39)
No. 1878. Bacterial Wilt of Corn .. .. .. (42)
No. 1872. House Plants .. .. (39)
No. 1876. Irrigation Problems in Citrus Orchards .. .. (39)
No. 619. Breeds of Draft Horses .. .. .. (31)

U.S.D.A. Technical Bulletin,

No. 766, September 1941—

The European Earwig. *S. E. Crumb, P. M. Eide and A. E. Born* .. (16)

No. 777, July 1941—

County Banking in Wisconsin. *Fred. L. Garlock* .. .. (23)

No. 775, July 1941—

The Yellow Chapote, a Native Host of the Mexican Fruitfly. *C. C. Plumer, M. McPhail and J. W. Monk* .. .. (16)

No. 778, July 1941—

The Biology and Control of the Sorghum Midge. *E. V. Water* .. (54)

No. 770, June 1940—

Investigation on the Storage of Nuts. *R. C. Wright* .. .. (39)

No. 774, May 1940—

Life-Histories and Habits of Some Grasshoppers of Economic Importance on the Great Plains. *Robert L. Shotwell* .. .. (16)

No. 776, June 1941—

A Comparative Study of Storage at 32° and 36° F. of Apples Grown in the Potomac River Valley. *M. H. Haller and J. M. Lutz* (39)

No. 779, May 1941—

The Effect of Certain Heart Rot Fungi on the Specific Gravity and Strength of Sitka Spruce and Douglas Fir. *Theodore C. Scheffer, T. R. C. Wilson, R. F. Luxford and Carl Hartley* .. .. (44)

No. 773, May 1941—

Kiln Design and Development of Schedules for Extracting Seed from Cones. *Raymond C. Reitz* .. .. (20)

No. 746, March 1941—

Quality of Irrigation Waters of the Hillister Area of California. *Frank M. Eaton, Roy D. McCallum, Miles S. May Hugh* (11, 13)

No. 745, April 1941—

Hardpan and Microrelief in Certain Soil Complexes of California. *C. C. Nikiforoff* .. .. (11)

Bulletin No. 217, June 1941—
Further Studies with the Musedine Grape. *E. F. Savage* et al. .. (39)

U.S.D.A. Leaflets,
No. 86— Protect Hardwood Stands from Grazing (40, 44)

U.S.D.A. Circulars,
No. 600, May 1941—
Mortality of the Apple Maggot in Fruit Held in Cold Storage. *P. J. Chapman and A. D. Hess* .. .. .. (39)
No. 582, May 1941—
Avocado Diseases in Florida. *H. E. Stevens and R. B. Piper* .. (39)
No. 610, September 1941—
Adsorption of Mercuric Chloride from Solution by Gladiolus Corms. *R. H. Nelson and C. E. Cassil* .. .. .. (39)
No. 605, June 1941—
The Internal Application of Chemicals to Kill Elm Trees and Prevent Barkbeetle Attack. *R. R. Whitten* .. .. .. (44)
No. 601, April 1941—
Reducing Power Waste in Operating Cotton Gins. *Victor L. Stedrousky and Arvid J. Johnson* .. .. .. (41)
No. 609, May 1941—
Indoor Composting for Mushroom Culture. *Edmund B. Lambert* .. (39)
No. 602, May 1941—
Field Infestation by Insects and that Injure Rice in Storage. *W. A. Douglas* .. .. (46)
No. 607, July 1941—
The Black Grain Stem Sawfly and the European Wheat Stem Sawfly in the United States. *E. J. Udine* .. .. (43)
No. 270, June 1941—
Orchard Insects of the Pacific North and Their Control. *E. J. Newcomer* .. .. (39)
No. 604, August 1941—
Trading in Wool-top Futures .. .. .. (33, 24)
No. 617, September 1941—
Tests of Species and Varieties of Vetch for Resistance to the Vetch Bruchid. *J. S. Pinckney and R. E. Stitt* .. .. .. (48)
No. 99, June 1941—
Equipment of City Milk Plants. *C. E. Clement, J. B. Bain and F. M. Grant* .. .. (29)
No. 611, June 1941—
The Pan-America Tomato, A New Red Variety Resistant to Fusarium Wilt. *William S. Porte* .. .. (39)
No. 608, August 1941—
Surface Condition of Soil and Time of Application as Related to Intake of Water. *F. L. Duley and L. L. Kelly* .. .. (11)

U.S.D.A. Farmer's Bulletins—
No. 1870. Pruning Hardy Plants .. .. .. (39)

No. 1877. Buying Boys' Suits .. .. .. (21)
No. 1875. Mushroom Growing in the United States .. .. (39)
No. 1879. Ponds for Wild Life .. .. .. (37)
No. 1880. Control of Insect Pests of Grain in Elevator Storage .. (45)
No. 1070. The Fowl Tick and How Premises may be Freed from It (32)
No. 1508. Poultry Keeping .. .. (32)
No. 1422. Udder Diseases of Dairy Cows .. .. (30)
No. 1841. The Feeding of Chickens .. .. .. (32)
No. 1514. Control of Sugar Beet Nematode by Crop Rotation .. (50)
No. 1556. The Sorghum Midge with Suggestions for Control .. (54)
No. 1860. Gladiolus Diseases and Insects .. .. .. (39)
No. 1878. Bacterial Wilt of Corn .. .. .. (42)
No. 1872. House Plants .. .. (39)
No. 1876. Irrigation Problems in Citrus Orchards .. .. (39)
No. 619. Breeds of Draft Horses .. .. .. (31)

U.S.D.A. Technical Bulletin,

No. 766, September 1941—

The European Earwig. *S. E. Crumb, P. M. Eide and A. E. Born* .. (16)

No. 777, July 1941—

County Banking in Wisconsin. *Fred. L. Garlock* .. .. (23)

No. 775, July 1941—

The Yellow Chapote, a Native Host of the Mexican Fruitfly. *C. C. Plumer, M. McPhail and J. W. Monk* .. .. (16)

No. 778, July 1941—

The Biology and Control of the Sorghum Midge. *E. V. Water* .. (54)

No. 770, June 1940—

Investigation on the Storage of Nuts. *R. C. Wright* .. .. (39)

No. 774, May 1940—

Life-Histories and Habits of Some Grasshoppers of Economic Importance on the Great Plains. *Robert L. Shotwell* .. .. (16)

No. 776, June 1941—

A Comparative Study of Storage at 32° and 36° F. of Apples Grown in the Potomac River Valley. *M. H. Haller and J. M. Lutz* (39)

No. 779, May 1941—

The Effect of Certain Heart Rot Fungi on the Specific Gravity and Strength of Sitka Spruce and Douglas Fir. *Theodore C. Scheffer, T. R. C. Wilson, R. F. Luxford and Carl Hartley* .. .. (44)

No. 773, May 1941—

Kiln Design and Development of Schedules for Extracting Seed from Cones. *Raymond C. Reitz* .. .. (20)

No. 746, March 1941—

Quality of Irrigation Waters of the Hillister Area of California. *Frank M. Eaton, Roy D. McCallum, Miles S. May Hugh* (11, 13)

No. 745, April 1941—

Hardpan and Microrelief in Certain Soil Complexes of California. *C. C. Nikiforoff* .. .. (11)

Vol. 29, No. 7, July 1941—
Manurial and Cultivation Experiments on Cocoanuts. *R. G. H. Wilshaw* .. .. (55)
The Malayan Rubber Planting Industry in 1940 .. .. (53)
Quarterly Report on the Malayan Pineapple Canning Industry .. (39)
Vol. 29, No. 8, August 1941—
A Manurial Experiment with Merker and Napier Grasses. *C. D. V. Georgi, A. B. Lucy and Gum Ley Teik* .. .. .. (40)
Conditions on Rubber Small Holdings in Malaya, 2nd Quarter, 1941 (53)
Vol. 29, No. 9, September 1941—
A Review of Some Recent Entomological Investigations and Observations. *G. H. Carbett and H. T. Pagdan* .. .. (16)
Vol. 29, No. 10, October 1941—
Picking *versus* Natural Fall in Cocoanut Harvesting. *H. J. Simpson* (55)
Development of Cattle Grazing Grounds in Kelantan. *H. K. Ashby* (40)
Quarterly Report on the Malayan Pineapple Industry .. .. (39)
Vol. 29, No. 11, November 1941—
Ash from Coconut and Oil Palm Waste Products as a Substitute Potassium Fertilizer. *C. D. V. Georgi* .. .. .. (55)
Quarterly Report on Rubber Small Holdings in Malaya, 3rd Quarter, 1941 .. .. (53)

The Tropical Agriculturist, Ceylon,
Vol. 96, No. 5, May 1941—
A Virus Disease of *Ageratum Conyzoides* and Tobacco. *C. H. Gadd and C. A. Loos* .. .. (56)
Cultural Experiments with Turmeric. *W. R. C. Paul and M. Fernando* (47)
Recently Introduced Food Crops at the Experiment Station, Peradenia—III. Cowpea; Bombay Variety. *C. N. E. J. Mel and P. M. Gaywala* .. .. (48)
Weeding in the Upcountry Timber and Fuel Plantations. *C. H. Holmes* .. .. (44)
Marmalade Making from Ceylon Citrus Fruits .. .. (39)
Sugarcane in Ceylon .. .. (49)
Cinchona in Guatamela (*Selection*) .. .. .. (53)
Cultivation of Castor Seed in Brazil (*Selection*) .. .. (52)
Vol. 96, No. 6, June 1941—
Cocoanut Cultivation in the Island of Trinidad, British West Indies. *W. V. D. Pieris* .. .. (55)
The Relative Resistance of Some Strains of Bitter Gourd to the Cucurbit Fruitfly. *M. Fernando and S. B. Udurawana* .. (39)
A Note on Some Preliminary Cold Storage Investigations Relating to Ceylon Fruits. *A. W. R. Joachim and T. H. Parsons* .. (39)
Poisoning of Cattle by Artificial Manures. *M. Crawford* .. (30)
The Selection and Propagation of Limes (*Selection*) .. .. (39)
The Failure of Pure and High-grade European Cattle in Hot Climates (*Selection*) .. .. (30)

INDEX OF SUBJECTS

The numbers against each subject refer to the following classification:—

General .. .. (1)

Agriculture—

Statistics, Arithmetic and Unclassed .. .. .. (2)
Meteorology .. .. (3)
Soil Defence and Valuation .. .. (4)
Irrigation and Drainage .. .. (5)
Farming Systems and Crop Management .. .. .. (6)

Botany—

Seed and Seed Inspection .. .. (7)
Weeds and Their Eradication .. .. (8)
Plant Description, Systematic Botany .. .. .. (9)
Biology and Breeding of Plants .. .. (10)

Chemistry—

Soil and Fertilizer Chemistry .. .. (11)
Plant Chemistry .. .. (12)
General Chemistry .. .. (13)
Food Chemistry .. .. (14)

Mycology—

Plant Diseases and Their Control .. .. .. (15)

Entomology—

Insects .. .. (16)
Insecticides .. .. (17)
Birds .. .. (18)
Other Harmful Animals .. .. (19)

Engineering—

Agricultural Machinery Operations, Buildings and Materials .. (20)

Economics—

Home and Home Making .. .. (21)
Diet and Health .. .. (22)
Community, Social, Educational, Land Habilitation, etc. .. (23)
Prices and Marketing .. .. (24)
State and General Economics .. .. (25)
Farming Costs, etc. .. .. (26)

Livestock—

Dairy Farm Economics and Management .. .. .. (27)
Silos and Silage Making .. .. (28)
Milk and Other Livestock Products .. .. .. (29)
Veterinary, Cattle, Cattle Feeding and Cattle Breeding .. .. (30)
Horses .. .. (31)

Poultry, Turkeys, etc. .. .. (32)
Sheep .. .. (33)
Bees and Honey .. .. (34)
Pigs, Hogs, etc. .. .. (35)
Goats .. .. (36)
Game, Wild Life, Other Animals, Fish .. .. .. (37)
Sericulture .. .. (38)

Crops—
Fruits, Vegetables and Flowers .. .. .. (39)
Pastures and Forage Crops .. .. (40)
Cotton .. .. (41)
Corn .. .. (42)
Wheat .. .. (43)
Forest Economic and Timber Plants .. .. .. (44)
Cereals in General .. .. (45)
Rice .. .. (46)
Potatoes and Other Roots and Rhizomes .. .. .. (47)
Pulses and Beans .. .. (48)
Sugarcane .. .. (49)
Sugar Crops other than Sugarcane .. .. .. (50)
Fibre Crops other than Cotton .. .. (51)
Oil Seeds .. .. (52)
Coffee, Tea, Cardamoms, Pepper, Arecanut, Rubber, Clove, Betel Leaves, Cocoa, Cinchona .. .. (53)
Sorghums .. .. (54)
Palms and Cocoanut .. .. (55)
Tobacco .. .. (56)
Miscellaneous .. .. (57)

39-42 Printed at The Bangalore Press, Mysore Road, Bangalore City,
by G. Srinivasa Rao, Superintendent